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ABSTRACT

This report discusses the analysis of selected factors related to public school enrollment and describes the development of a model for projecting student enrollment using a systems analysis approach. Chapter 1 discusses the purpose of the study, the techniques employed in the study, and the organization of the report. Chapters 2 and 3 provide an overview of the Corvallis (Oregon) metropolitan area and examines past and present enrollment trends for the Corvallis School District. Chapter 4 describes in detail the development and use of an enrollment projection model for the Corvallis School District, and chapter 5 applies the model described in chapter 4 to projecting enrollments for the Corvallis School District. (Author/JG)

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AN ANALYSIS OF SELECTED FACTORS
RELATED TO SCHOOL ENROLLMENT:

The Development of a Computerized Enrollment Projection Model
for Corvallis School District 509J
Benton County, Oregon

by

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April 1970

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Mrs. Frances S. Gallagher, Chairman
Corvallis School District #509J
1555 S.W. 35th Street
Corvallis, Oregon 97330

Dear Mrs. Gallagher:

Attached is the report of the study for the Corvallis Public Schools completed under a contract with the Bureau of Educational Research and Service. The central question addressed in this study concerns the analysis of selected factors related to school enrollment in the Corvallis School District and the development of a model for projecting student enrollment using a systems analysis approach.

In light of the importance of enrollment estimates to adequate educational planning, such an analysis of data is a sound practice. The development of an enrollment projection model represents the establishment of a systematic technique to forecast enrollments, which may be updated yearly by the school district.

The Bureau study team appreciates the excellent cooperation extended by the board members and the administrative staff, as well as by various local agencies and citizens who contributed pertinent information. Their assistance was invaluable in the gathering of data and most essential to the successful completion of this study.

The Corvallis School District should be commended for its decision to request this detailed study, which should provide a workable instrument for projecting enrollments for the years ahead. It is hoped that the report will serve the district well as it continues to seek quality opportunities for the children and youth of the community.

Sincerely,

A handwritten signature in dark ink, appearing to read "P. B. Jacobson".

Paul B. Jacobson, Dean
College of Education

PBJ:jc

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CHAPTER I

INTRODUCTION

Forecasting pupil enrollment is one of the most perplexing problems which school districts must face. Inasmuch as many operational decisions are dependent on the number of students a district anticipates serving at various educational levels, accurate enrollment projections constitute an extremely important factor in the educational planning process. Short-range decisions that hinge on projected enrollment include staff needs, salary costs, and many purchasing plans related to supplies and equipment. Long-range decisions that require projected data include district building programs, bond authorization elections, and the planning of debt retirement programs.

It follows that school districts must make every effort to obtain reliable enrollment projections. With this necessity in mind, the Corvallis School District has allocated sufficient time and resources to procure updated projections and has contracted with the Bureau of Educational Research and Service for the development of a projection model.

It is generally recognized that there is no known method of predicting future enrollments with absolute and guaranteed accuracy. Economic growth, in- and out-migration, demographic factors, the holding power of the schools, changes in the status of public and/or parochial schools in the district, changes in the boundaries of a district, and other factors, all may have a direct influence on the future enrollment of a school district. Many of these are difficult to assess or predict, hence the impossibility of absolute and guaranteed accuracy in projecting enrollments.

If such estimates of future student enrollments are to be usable and reasonably reliable, certain assumptions must be made with regard to the variables which may affect enrollments. It is important to recognize that the accuracy of the enrollment projections is completely dependent upon the soundness of those assumptions. It is also true that the possibility of error increases rapidly as projections are carried further and further into the future because forces which had not been anticipated have more chance to appear.

In the past, school districts have utilized several enrollment projection techniques based upon various assumptions. To ascertain the most current predictive techniques, the Bureau of Educational Research and Service conducted a nation-wide survey of agencies¹ involved in making enrollment projections. It was found that the techniques most commonly used to predict student enrollment may be classified into three general categories: 1) mathematical methods which make use of past trends in total population of the area, 2) demographic techniques which analyze separately the trends in the components of population change (such as births, deaths, migration), and 3) a variety of miscellaneous techniques using symptomatic data to estimate future total population without intermediate estimation of components.

Responses from educational agencies across the nation indicated that the most commonly used enrollment projection techniques are based upon county birth

¹Essentially those agencies contacted were various university research bureaus and nearly all state departments of education. Approximately 125 letters were sent out asking for examples of studies involving enrollment projections, a clear indication of techniques employed, and basic assumptions underlying the techniques plus any leads to other sources the contact might deem fruitful. On the last point, a fair number of new leads were suggested and these were followed up.

statistics and/or cohort survival techniques. The Bureau of Educational Research and Service currently makes enrollment projections for school districts in Oregon using these procedures.

The following methods represent the most commonly used enrollment projection techniques:

County Birth and Cohort Survival Projection²

The method entitled County Birth and Cohort Survival Projection consists of two determinations: 1) a way is found to estimate the future enrollments of a primary grade, such as kindergarten or grade 1; and 2) enrollment is projected to successive years by grade progression ratios. The first figures are computed by determining a ratio between live births in a given county six years previously and grade 1 enrollments for a period of years. For example:

$$\text{Ratio} = \frac{\text{Number of first grade students in a given year}}{\text{Number of county live births six years previously}}$$

Trends are analyzed on the basis of historical experience, and first grade enrollments are projected. The grade enrollment is then projected to successive years by a series of grade progression ratios (see page 37 in Chapter III) or retention ratios established from this experience. A retention ratio is the ratio of the enrollment of any grade to the enrollment of the preceding grade in the previous year.

Past Enrollment and Cohort Survival Projection

Essentially this method--the Past Enrollment and Cohort Survival Projection-- consists of two determinations: 1) projected first grade enrollments,

²For a more detailed examination of this and the other techniques mentioned, see: Wallace H. Strevell, "Techniques of Estimating Future Enrollment," American School Board Journal, March, 1952, pp. 35-39. This article contains a discussion of basic assumptions.

and 2) establishment of retention ratios from past historical experience. First grade enrollments are projected by applying the average rate increase over a span of time to the average first grade enrollments during the same period. Other grade enrollments are projected to successive years by applying a series of grade progression or retention ratios established from past historical experience.

Census Class Projection

By the technique of Census Class Projection, available data from a number of census collections are used to construct a child population chart by groups of age levels. From a series of ratios the average trend is determined. To estimate the future public school enrollment, the percentage of each age level enrolled according to past experience is applied to the projected census classes.

Housing Projection

The method called Housing Projection involves preparing a contingency estimate of enrollment based upon the number of homes and the average enrollment per household. The district is divided into types of residential areas and types of dwellings, and from the regular school census the respective average family structure is estimated. By an analysis of trends in housing an estimated pupil population is projected.

Population Projection

In this method, Population Projection, a ratio of school-age population to total population is determined. This ratio is established and applied to the total population projections as a method to obtain estimated pupil population forecasts. Local variations from state and national trends with respect to this ratio are inferred from past trends of the school district.

These, then, are the most commonly used enrollment techniques. It should be recognized that these methods have primarily been designed for large and self-contained areas.³ Some real difficulties have been experienced with these techniques in estimating student enrollment for small areas, such as a school district. One key factor which has influenced the reliability of current enrollment projection techniques has been the greatly increased mobility of the general population. The following statement in a report by the American Association of School Administrators School Building Commission appears to summarize the present state of student enrollment projection theory:

To date, no exact method or formulas have been developed which can predict future changes in population in localized areas with a high degree of accuracy. Many factors affect school enrollment and are related to unknown future conditions. To compensate, as many methods as possible should be used, only reliable data should be employed and estimates should be revised as often as new data are available.⁴

Although realizing that no infallible formula for projecting student enrollment is available, the Corvallis School District contracted with the Bureau of Educational Research and Service for developing a projection model, using the newest computer techniques and a systems analysis approach. The research team adopted a systems analysis approach similar to the one described by Harry J. Hartley:

³ A basic assumption, often unmentioned in all these techniques, is one of a closed system. That is, it is assumed that in/out-migration is non-existent from the time the initial data are collected. Of course, one might achieve the same results by making the assumption that in/out-migration exists but is always in balance.

⁴ Office of Research, Sub-Report #2: How Future Public School Membership in the State of Hawaii Is Estimated, State of Hawaii, Department of Education, October, 1967.

The systems expert first decides what questions are relevant to his inquiry, attempts to operationalize vaguely stated objectives, eliminates certain imprecise factors, ascertains quantifiable variables, specifies his assumptions, and selects the appropriate models and analytical tools for the specific problem.⁵

In terms of utilizing the key elements of the systems analysis approach, it became clear that the enrollment projection model should be developed using a high-speed digital computer, such as the IBM 360. The rationale for designing a computer-assisted student enrollment projection model is based on these premises:

- 1) The speed of computerized techniques for enrollment projections facilitates obtaining several projections based upon alternative assumptions.
- 2) Certain variables such as total population, migration, economic growth, and growth of Oregon State University may be statistically analyzed to determine their relationship to the student enrollment of Corvallis School District with far greater ease than by usual manual techniques.
- 3) Computer programs relieve the central office administrative personnel of the arduous task of computation as well as increasing the accuracy of output data.
- 4) The projection model, once developed, may be updated yearly by the Corvallis School District using an IBM 360.

The study consisted of three basic phases with phase one being the overview and formulation of the problem; phase two, the development of the projection model; and phase three, the application of the model to project future student enrollment for the Corvallis School District.

⁵ Harry J. Hartley, Educational Planning--Programming, Budgeting: A Systems Approach, Prentice-Hall, Inc., New Jersey, 1968, p. 24.

In addition to this introductory chapter, Chapter I, the written report of the study contains four other chapters. Chapters II and III are an analysis of the observations made and information collected about the metropolitan area of Corvallis and School District 509J, past and present. Chapter IV deals with the development of the model. The last chapter, Chapter V, is an application of the model for the purpose of projecting the enrollment for District 509J.

CHAPTER II

OVERVIEW OF SELECTED POPULATION AND LAND USE CHARACTERISTICS OF THE CORVALLIS METROPOLITAN AREA

The city of Corvallis, Oregon, the county seat of Benton County and the home of Oregon State University, is located on the Willamette River, 85 miles south of Portland and 55 miles from the Oregon coast.

The Corvallis Metropolitan Area, hereafter designated as CMA (Figure I), which corresponds roughly with the present boundaries of School District 509J, excluding Philomath, lies at the eastern extremity of Benton County and includes a small portion of Linn County (Figure II).

Since 1940 the city of Corvallis, which accounts for two-thirds of the school district's enrollment, has had a fairly rapid rise in population, and predictions are that its rate of growth will be accelerated in the future (Figure III). Earlier studies of population trends for the general area project a steady growth in population for the city of Corvallis.¹

¹Studies that might be cited include Population Trends in Corvallis, prepared by the Bureau of Governmental Research (formerly Municipal Research), University of Oregon, 1959, and an updated study done by the Corvallis City Planning Office in 1962, which supports the earlier study. The majority of the Benton County population resides within the city limits of Corvallis. The Center for Population Research and Census at Portland State University reports a figure of 31,350 for the city of Corvallis and 48,150 for Benton County. Since 1950 the percentage of the Benton County population living inside the Corvallis city limits has increased steadily from 51% in that year to 65% in 1968. Only a portion of this growth can be credited to annexation of areas contiguous to Corvallis. Most of this change is probably a reflection of a national growth of urban population and a decline in rural population. It would be a reasonable estimate that CMA contains upwards of 40,000 persons, or better than 83% of the total population of the county. (This, of course, does not take into account the population in adjacent areas of Linn County.)

Figure 1. MAP OF OREGON LOCATING THE CORVALLIS METROPOLITAN AREA

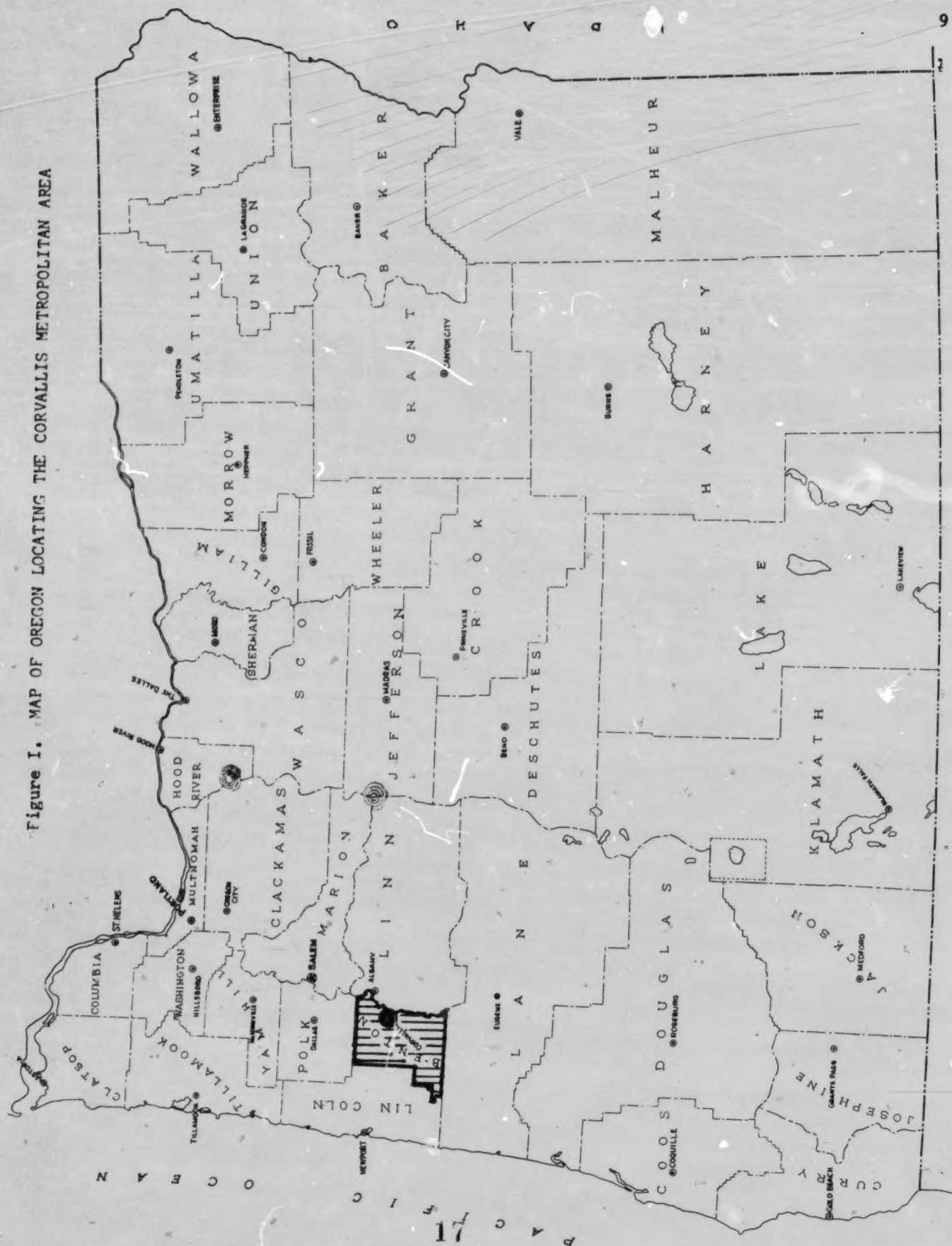


Figure II. DISTRICT 509J, CORVALLIS PUBLIC SCHOOLS

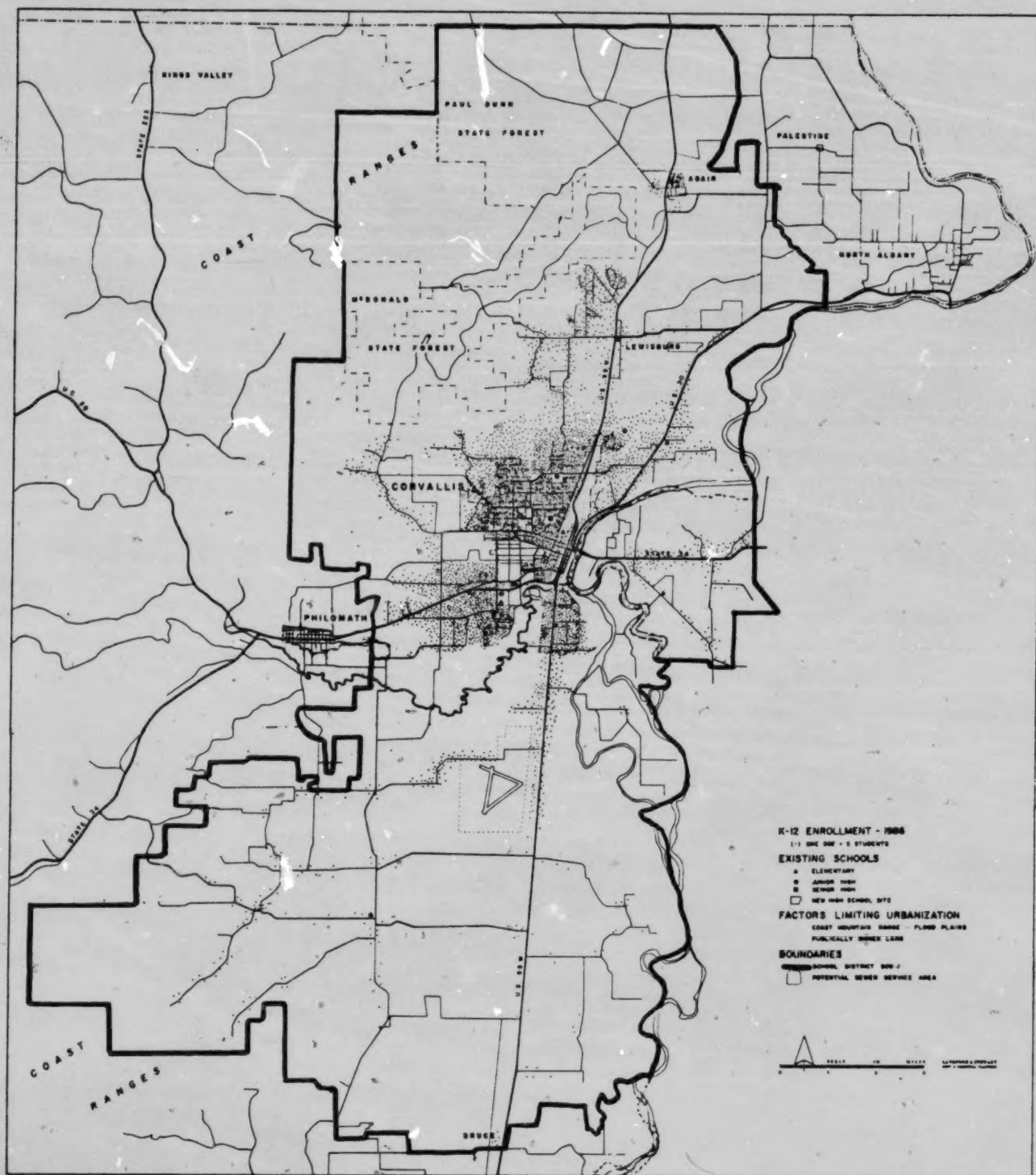
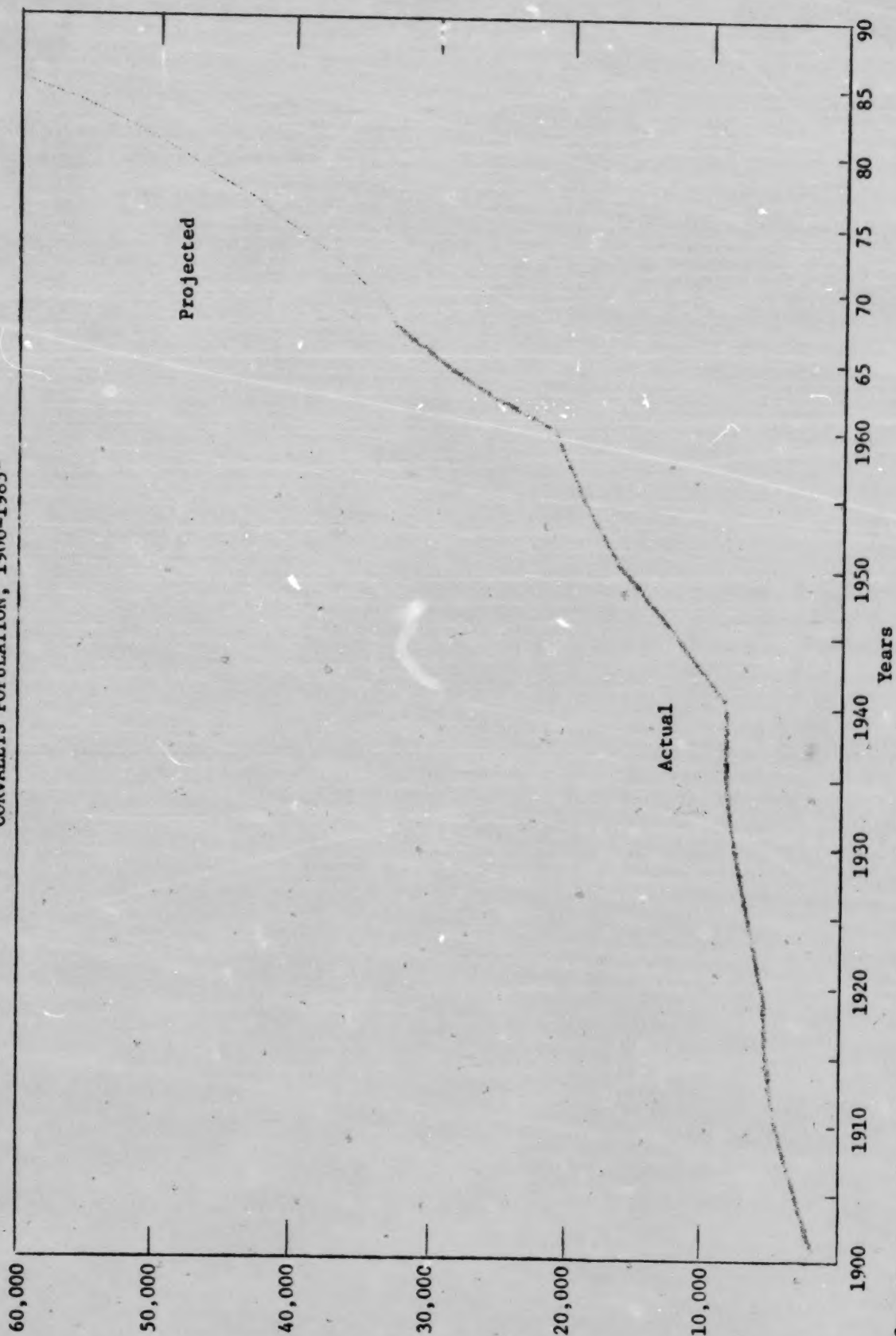


Figure III
CORVALLIS POPULATION, 1900-1985^a



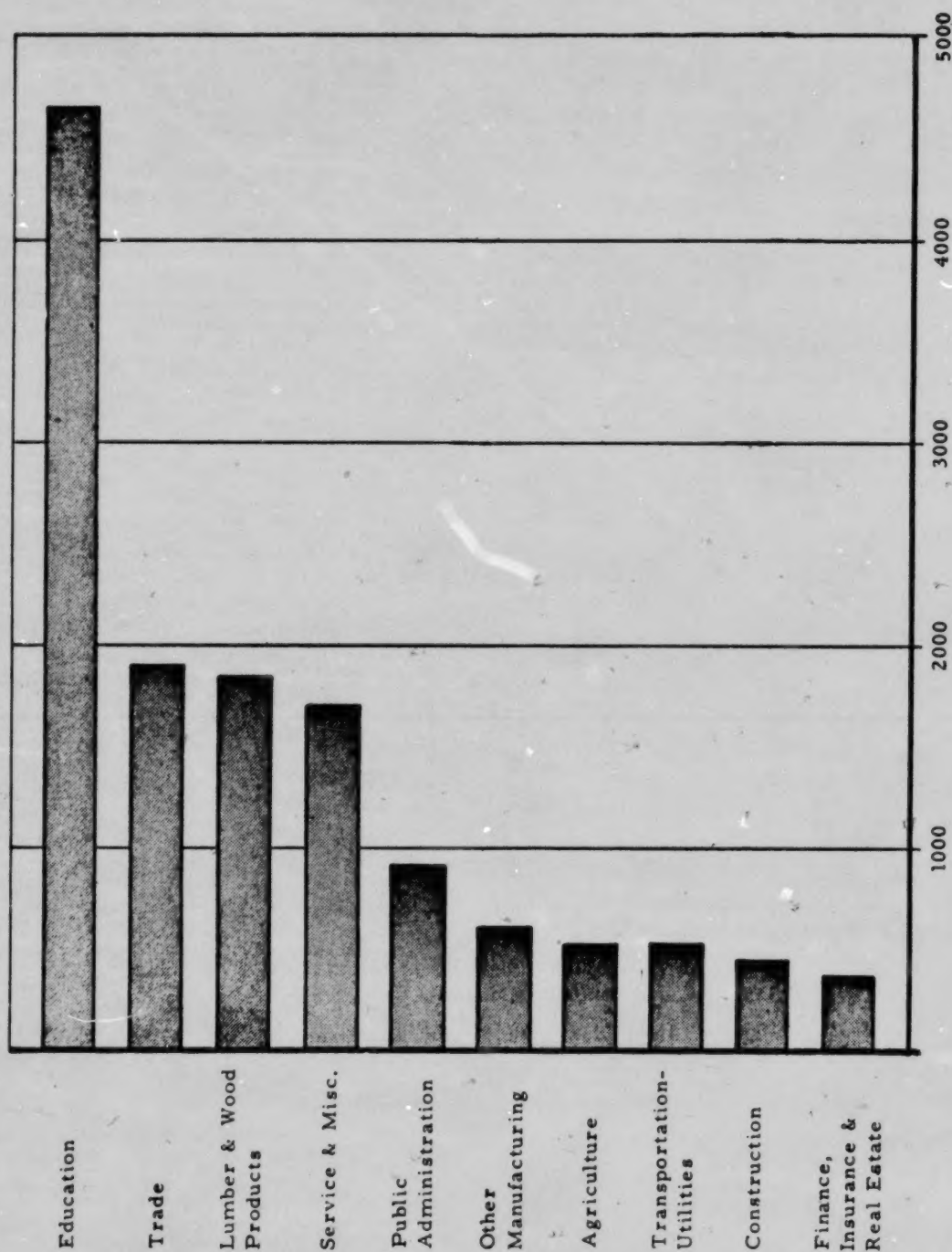
^a Predictions, Oregon Bureau of Governmental Research

A substantial portion of this growth (how substantial a portion will be examined below) is due to one "industry," Oregon State University. This institution contributes to CMA growth, directly through students and staff, and indirectly through other enterprises and people. Some observers interviewed by the research team suggested that because of this direct, measurable phenomenon and the indirect (almost unmeasurable) impact, Corvallis might well be characterized as a "one industry town."

The evidence does support the notion that the single largest industry in the CMA in terms of employment and personal income is the University. Figure IV indicates that education employed in 1965 more than one-third of the labor force in Benton County. An examination of the employment records of OSU for the academic year 1965-66 shows that the University employed nearly 3,800 academic and classified individuals.² This is approximately 80 percent of all those employed in the field of education in Benton County in 1965 (See Figure IV). Employment figures for the county and city from the 1950 and 1960 U. S. Census reports also indicate that the category of

²This figure includes part-time employees as well as a number of extension personnel. The number of people employed at the University in all classifications has risen steadily since 1960-61 when figures first became available. In that year there were 1,426 academic and 1,335 classified employees for a total of 2,761. The year 1968-69 saw 2,187 academic and 2,175 classified employees for a total of 4,362. (Figures obtained through the Office of Dean of Administration, Oregon State University.)

FIGURE IV. OCCUPATIONAL DISTRIBUTION OF THE LABOR FORCE - BENTON COUNTY, 1965



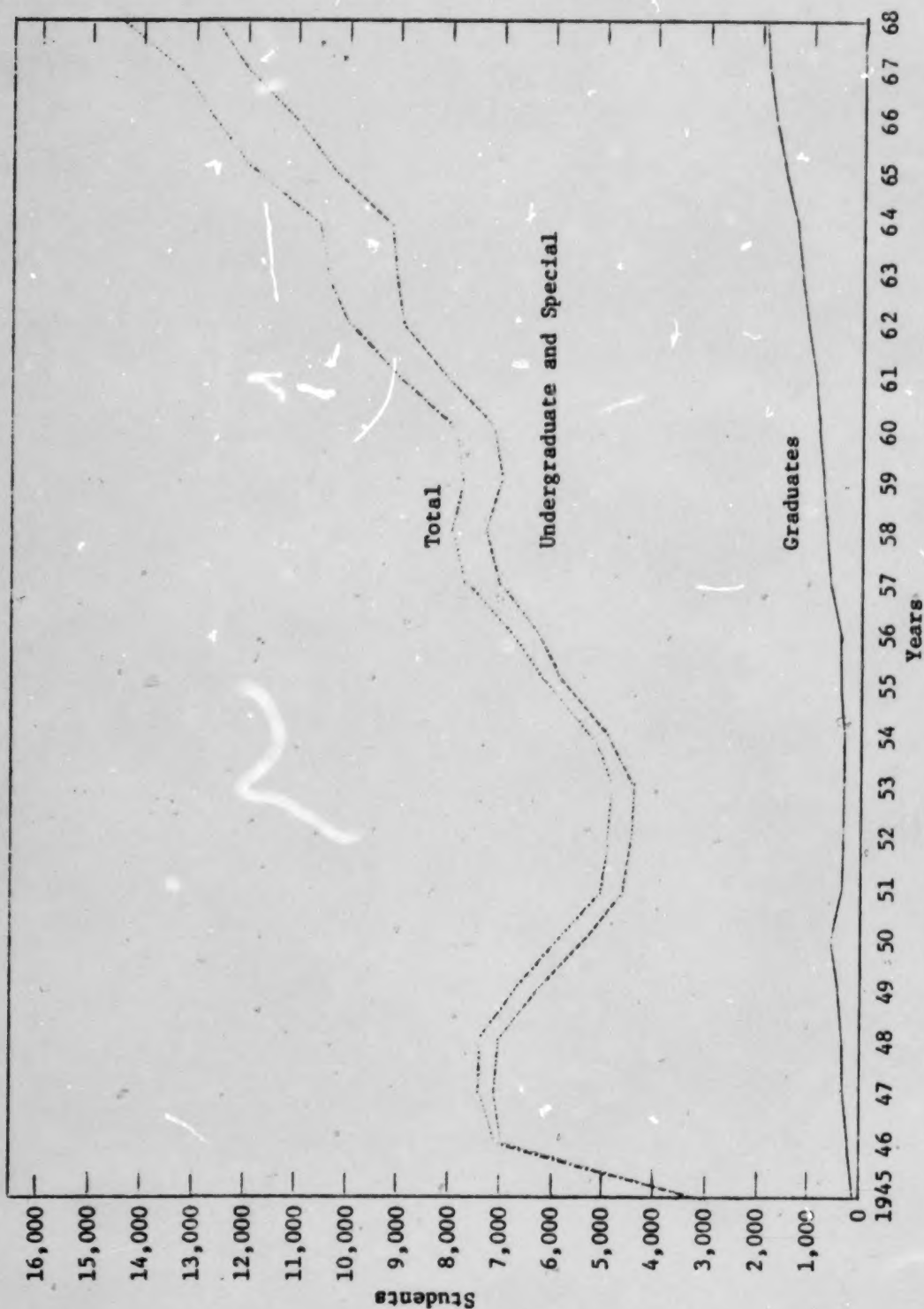
professional services, which includes education, employed 37 percent and 43 percent, respectively, for those two years in the city and 25 percent and 31 percent, respectively, for the county.³

Another way to document the impact of the University on the CMA is to view the growth of enrollment over the years. Figure V shows the undergraduate, graduate, and total enrollments since 1945 and except for the post World War II era in the early 1950's which saw the departure of veterans, the trend of enrollment is clearly up. In fact, the number of students has nearly doubled in the past ten years. It might be noted that graduate enrollment has grown slowly though steadily over this period to approximately 2,000 in 1968. It appears that graduate enrollment is beginning to stabilize. With the recent ceilings placed by the State Legislature there may be little growth in the near future. This factor is of some importance to this study for it is this group of older students that tend to be married and have school-age children. Table 1 is a breakdown of enrollment for each term over the same span of time.⁴

³ Cited by: Economic Prospects and Industrial Location Factors, Bureau of Municipal (Governmental) Research, University of Oregon, 1963, pp. 10-11. This particular study suggests, "Historically, Corvallis has had a growth paralleling that of Oregon State University. The importance of the University to the economy of Corvallis can hardly be overemphasized. It is anticipated that future significant growth in the Corvallis urban area will occur because of the University and University-oriented research and development industries broadening the community's economic base. Up to now, the largest share of research work in Corvallis has been for government. This will probably continue to furnish the major source of University research funds for some time to come. . . ." pp. 10 and 14. This general assertion has held up through 1969 and the appearance of a large number of private R and D firms is yet to occur. Since 1963 contract and grant expenditures by the University have risen from approximately \$4.5 million to over \$9 million. The vast proportion of this money comes from governmental sources, not from private companies.

⁴ It was suggested to the research team by several individuals in the process of the field work that spring enrollment at OSU seemed to be the best indicator of the next year's fall enrollment in District 509J. In the early statistical manipulations, a high correlation was found between these two figures, but an equally high correlation was found to exist between the district's fall enrollment and the OSU enrollment figures for the other two terms. This means simply that if OSU enrollment was used as a predictor variable for the district's enrollment, it would make no difference which of the three terms of OSU enrollment was used.

Figure V
OREGON STATE UNIVERSITY ENROLLMENT — 1945 THROUGH 1968^a



^aData for Figure V obtained from Office of Institutional Research, Oregon State System of Higher Education. The data contained in Figure V are the fall enrollment of each year.

Table 1
OREGON STATE UNIVERSITY ENROLLMENT BY TERM
1945 THROUGH 1969^a

Year	Fall	Winter	Spring
1945-46	3,126	3,989	4,223
1946-47	7,133	7,003	6,499
1947-48	7,489	7,089	6,659
1948-49	7,428	7,118	6,596
1949-50	6,793	6,549	6,023
1950-51	5,887	5,408	5,097
1951-52	5,002	4,706	4,418
1952-53	4,912	4,668	4,338
1953-54	4,868	4,614	4,333
1954-55	5,241	5,126	4,805
1955-56	6,160	5,956	5,561
1956-57	6,791	6,628	6,159
1957-58	7,676	7,490	6,997
1958-59	7,981	7,577	6,964
1959-60	7,729	7,448	6,923
1960-61	7,899	7,703	7,359
1961-62	9,039	8,757	8,310
1962-63	10,037	9,645	8,923
1963-64	10,427	9,812	9,329
1964-65	10,533	10,158	9,695
1965-66	11,906	11,397	10,722
1966-67	12,668	11,957	11,343
1967-68	13,358	12,825	12,222
1968-69	14,524	13,917	13,242

^aData supplied by the Office of Institutional Research, Oregon System of Higher Education, May 15, 1969.

It was stated in footnote 1 that the approximate population of the CMA can be set at 40,000. When one considers an enrollment at OSU of approximately 15,000 (included generally in the 40,000 population figure) and an employment figure at OSU part and full time of 4,400, then the assertion can be made that the impact of the University is substantial.

Further, when one examines this matter from an economic view in the form of the history of personal income by its major sources for Benton County, it becomes clear that the growth of various governmental sources is considerable and in recent years by far the largest single contributor to personal income. (See Table 2.) To further expand on this point, Table 3 breaks down the governmental sources and relates these to the total of all sources and one item from private non-farm earnings--manufacturing.

An examination of the data from these two tables indicates that agriculture cannot be considered the major economic resource as marked by personal income in Benton County (nor for that matter lumbering, which has been on the decline for several years in the county). Rather, personal earnings from governmental sources--federal (non-military), state, and local--must be considered the major economic resource of the area, while manufacturing is but half as much. Figures for wholesale and retail trade and services exceed those for manufacturing by nearly \$6 million.

With the aid of Figure VI, three additional points may be made. First, the rate of growth of salaries and wages (personal income) at OSU has increased in recent years and has more than doubled in the last ten years reaching nearly \$28,500,000 in 1967. Second, using the 1966 figure from Tables 2 and 3 of \$97,150,000 total personal income, one finds that the comparable 1966 OSU figure represents nearly 30 percent of the total for that year. There is nothing

TABLE 2^a
 TOTAL PERSONAL INCOME BY MAJOR SOURCES
 FOR BENTON COUNTY
 (in thousands of dollars)

Year	Total	Farm Earning	Governmental Earning	Private Non- Farm Earning ^b
1929	5,696	1,624	548	3,524
1940	5,873	1,081	1,009	3,783
1950	31,496	2,908	8,789	19,799
1959	61,482	1,696	20,432	39,354
1962	66,970	1,140	25,093	40,737
1965	88,167	2,094	33,106	52,967
1966	97,150	2,185	38,257	56,708

^aData for Tables 2 and 3 were secured from the Bureau of Business and Economic Research, University of Oregon.

^bSubcategories of this item include manufacturing, wholesale and retail trade, and services. These three items represent 75 percent of the 1966 figure. Manufacturing alone represents only 33 percent of the 1966 figure. See Table 3 for further amplification.

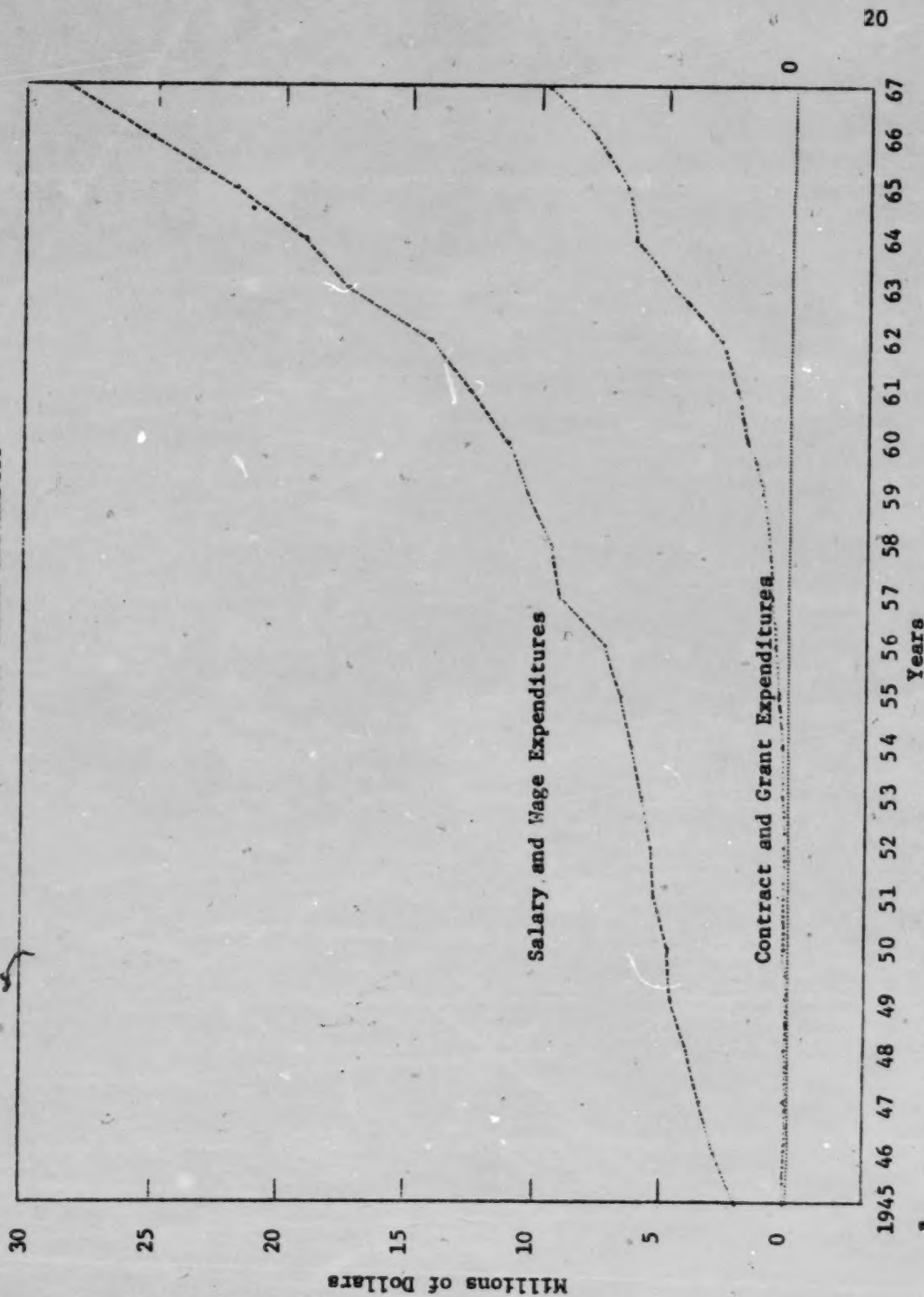
Table 3

PERSONAL INCOME FROM GOVERNMENTAL SOURCES AND MANUFACTURING
FOR BENTON COUNTY
(in thousands of dollars)

Year	Total Personal Earnings	Manufac- turing	Wholesale and Retail Trade and Services	Government Earnings		
				Federal Civilian	Federal Military ^a	State & Local
1929	\$ 5,696	\$ 721	\$ 1,921	\$ 161	\$ 9	\$ 378
1940	5,873	891	2,144	525	12	472
1950	31,496	5,876	9,596	708	349	7,732
1959	61,482	12,626	16,791	2,180	3,020	15,232
1962	66,970	12,961	18,714	2,741	2,605	19,747
1965	88,167	18,318	23,834	3,412	4,372	25,322
1966	97,150	19,032	25,855	5,030	6,443	26,784

^aThe size of the more recent figures is primarily due to a military base known as Adair.

Figure VI
SALARY AND WAGE EXPENDITURES--CONTRACT AND GRANT EXPENDITURES^a
OREGON STATE UNIVERSITY



^aData secured through the Dean of Administration's office, Oregon State University.

at this point to indicate any deterrent to a continued increase, at least for the near future. Third and last, the input of over \$9 million of contract and grant expenditures (a large portion of these funds coming from outside the region and even outside the state) strongly suggests the financial drawing power of the University.

It must be assumed that the University's presence in the community in terms of employees, students, and dollars generates directly or indirectly a large share of the personal income earnings from wholesale and retail trade and services (See footnote b, Table 2) as well as a small portion of the personal income earnings from manufacturing.⁵

To take a somewhat different look at economic factors, both Benton County and the city of Corvallis rank well above the national average in estimated net effective buying income. In 1966 Corvallis was recorded as first among the cities in the state at \$10,269 per household, and Benton County ranked third among the counties at \$9,440, behind only Sherman and Washington.⁶

⁵ An examination of similar data for Linn County and the city of Albany--the companion county and metropolitan center to Benton County and Corvallis--indicates a very different picture. Though the relationship of population between city and county is not nearly so high for Linn and Albany as for Benton and Corvallis, the amount of growth for the city of Albany between 1960 and 1968 accounts for somewhat better than half of Linn County's growth. Albany metropolitan area is clearly growing economically and has grown because industrial development of the wood and wood products sort. Metallurgy industries are expected to have an impact on Albany's future development. See: Robert D. Russell, Linn County Manpower Resources Study, State of Oregon, Manpower Studies Unit and Research Statistics Section, Department of Employment, Salem, Oregon, 1966. Albany is seen as a very different urban area from Corvallis if one examines the sources of economic wealth.

⁶ Bruce McKinlay, Oregon Economic Statistics, Bureau of Business and Economic Research, University of Oregon, Eugene, Oregon, 1968, pp. 31-32. "Net effective buying income is a concept closely analogous to the 'disposable personal income' term used by the U. S. Department of Commerce; it does not include federal, state or local taxes." Quoted in footnote p. 31 of the before mentioned source.

It appears that given the economic position of the University as well as its nature and the lack, historically, of basic industry in the CMA, the "character" of Corvallis and its immediate environment would indicate an upper middle class community. Income levels mentioned above certainly suggest this. Further, if it is assumed that there is a close relationship between economic growth and general population increase (both evident in the CMA), then it may be assumed that the growing economic impact of OSU on the CMA is and will be a major factor in the increase of the non-OSU connected population in the CMA.

However, any speculation about the future would need to consider among other things a wider geographic area. The effects of areas adjacent to District 509J must be considered in assessing the population growth potential of the district. (See footnote 5.) While Corvallis has attracted some light industry, Albany has become the site of heavier industrial development. Since the district's eastern boundary is less than ten miles from the city limits of Albany, one must be aware of the possibility that persons employed in Albany may take up residence within the 509J attendance area.⁷ Also to be considered is the impact of additional firms such as the American Can Company at Halsey,⁸ or the possible adoption of a regional plan such as the Willamette Valley Urban Systems Demonstration Project.

⁷ The reader should be aware that as a part of the Corvallis Area Transportation Study (done jointly by the City Planning Office, the State of Oregon Highway Department and the Bureau of Governmental Research, University of Oregon), the State Highway Department during the fall of 1965 attempted to determine in/out auto destination patterns at given times of the day. These data are not readily available for examination, however. Though four years old, an analysis of some of the data might yield a crude measure of the number of people who lived in Corvallis and worked in the Albany area at that time. Another study to obtain the same information of the current picture might be very helpful as would a periodic update. These additional studies might reveal a pattern of increasing Albany employment of Corvallis citizens.

⁸ In the short range, this new plant will have no impact in terms of added population to the CMA. The personnel office indicated that the plant will never employ many more than 500 and that of those thus far employed, nearly all live in the Albany area and Sweet Home or Eugene metropolitan areas.

Topographic features, zoning ordinances (city and county) and land value are the essential ingredients in the direction (where) and composition (size of family unit and density of family units) of population in any geographic area.⁹

There is, however, one additional factor, often overlooked until too late, which relates to the growth pattern--namely, the matter of soil composition or in a deeper sense, geological conditions. Failure to give adequate attention to such a factor may, for example, see whole neighborhoods sliding down a hill when climate conditions radically change and surface soil stabilization has not been achieved, or the gradual development of a sanitation problem when sewage or waste disposal is not, or for some reason cannot be, centralized.

All of these factors impose themselves on the CMA and determine how its land will be used just as in any other populated area. It is not the intent of this study to review these matters in detail. The research team is not qualified for such a review. Also on investigation, some of these matters have already been most adequately handled by previous studies produced or commissioned by the Corvallis City Planning Office. Very brief attention, however, to various aspects of land use in the CMA may be useful.

An examination of a map of the region (See Figure VII) suggests that the most likely direction of growth in the immediate future is to the northeast of the city between McDonald State Forest on the west and the flood plain on the east. It was discovered by the research team that a strong possibility existed for the opening of the area immediately west of the state forest to extensive residential construction when the existing road system in that section is upgraded and expanded.

⁹ This is not to suggest that natural topographic features of the landscape do not have a causal effect on zoning ordinances and land value. They do. But features that would greatly limit the human use of the land are often within man's capability to alter and thereby increase the diversity of use, often to the ultimate detriment of both inhabitants and the land, but that is another matter.

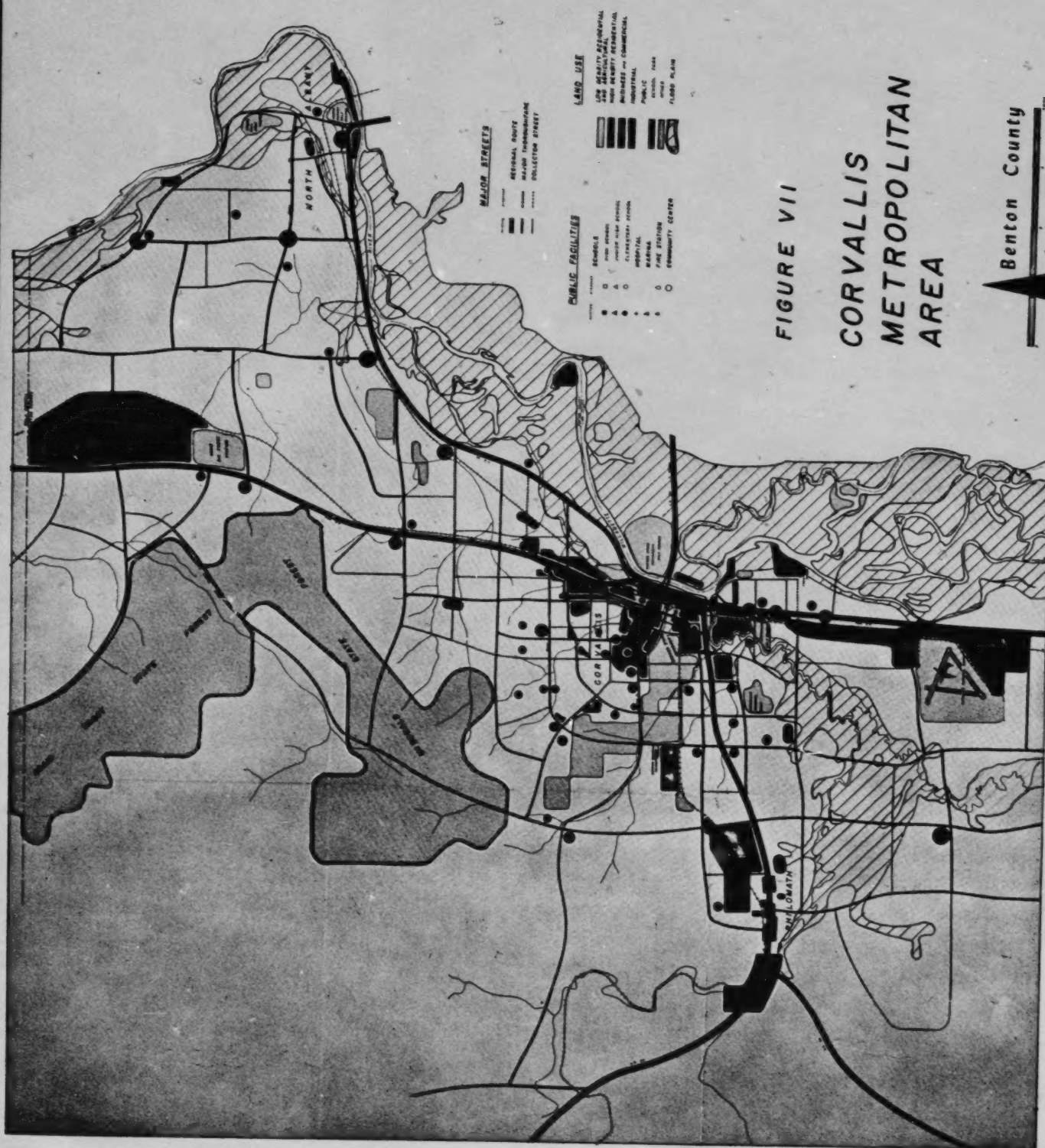


FIGURE VII
CORVALLIS
METROPOLITAN
AREA

Benton County Oregon

On the east, for the foreseeable future, any expansion of residential housing would be entirely dependent upon the flood control of the Willamette River. To the west, beyond the state forest, is the Coast Range.

To the south and southwest, such natural and man-made features as a minor flood plain of Mary's River and Municipal Airport plus zoning restriction lessen considerably the area for residential housing. Given the present boundaries of District 509J and assuming no substantial change in that boundary, it appears that the future direction of additional expansion of residential housing is to the northeast with some growth to the southwest.

Topographical features, while subject to change, are not as changeable as zoning and land value. There is little this report can say about land value and its fluctuation in the CMA except that on the basis of interview information it is apparently increasing. As land value increases, a re-examination of the use to which the land is put generally follows. For example, farm land adjacent to an urban area may become too valuable for agricultural use, and subdivisions or factories, or both, will replace green pastures. When unrestrained urban expansion takes place, land is often absorbed which should remain in agricultural use.

It is at this point that comprehensive zoning based on proper land use is of critical importance. The chief threat to such planning always seems to be the short-range drive for economic gain. In reality, it may in part be due to the lack of adequate coordination between governmental bodies whether contiguous or coterminous in the same region. In this last respect, the following quote seems in order:

A fourth basic consideration is the recognition of the fundamental nature of the Corvallis urban area as a single social and economic entity. The fact that a portion of this unit is within the corporate limits of the city of Corvallis and the balance is not, should be of little practical consequence as far as public policy (of both city and county jurisdictions) is concerned. In appreciation of this, it is suggested that definite arrangements be made for effecting continuing intergovernmental cooperation in the encouragement of the sound development of the area. Particularly significant would be:

- a. The encouragement of comprehensive planning and zoning in all of the unincorporated area surrounding the city.
- b. Definite arrangements for the systematic exchange of information and ideas between the planning agencies of the two jurisdictions.
- c. Definite arrangements for continuity and coordination of public policies and programs related to the development of the area.¹⁰

From a number of sources the research team received the distinct impression that the desired degree of intergovernmental cooperation and coordination had not yet been reached, some six years after the above quoted report was submitted.

The more District 509J can encourage a high degree of coordination and even be involved in matters of area planning, the more likely it will be that the district will gain some control over its future growth. Therefore, it seems relevant to point out a factor of some importance to the preceding suggestion-- the use of available knowledge of soil composition in the CMA in future planning of orderly growth.

It came to the attention of the research team while on the field portion of this project that during 1970 the CMA will have available valuable data detailing the soil composition of the entire area and recommendations as to how best to utilize the land throughout the entire county.

¹⁰ Economic Prospects and Industrial Location, Bureau of Governmental Research, University of Oregon, 1963, pp. 27-28. This report was prepared for the Corvallis City Planning Commission.

The most obvious use for such information is the long-range planning of new residential development. For example, given the assumption that medium and heavy residential expansion should not take place in those areas where decentralized sewage treatment would present a health hazard, the city and county governments will have the information for deciding where such residential expansion should be prevented.¹¹ As the extension of city or a metropolitan sewage system takes place, then new areas would be opened for medium and high residential expansion. It is most certainly a recommendation that District 509J use its good offices to urge the appropriate authorities to utilize this knowledge in future urban development. To elaborate, if those areas that cannot sustain, in a sanitation sense, medium and high density residential housing are taken out of consideration for building until such time as centralized sewage disposal was available, the district would be in a better position for planning its own future growth given the present boundaries. Given a slower pace of residential expansion such a plan of action would produce, the district would secure two advantages: first, the ability to more accurately select exact building site locations in advance of residential development; second, with a slower rate of residential expansion (and thereby one assumes a slower rate of population increase), the district may be able to gain on its bonded indebtedness, which has in large measure as in most districts been caused by rapid

¹¹ It is suggested that additional information on this matter is available from authorities in the field. The research team would mention Prof. Horace B. Cheney, Head of the Department of Soils at Oregon State University, Prof. Ted Sidor, Cooperative Extension Service, Oregon State University, among others at the University who were good enough to give up the better part of a morning to inform the uninformed. In addition, Mr. Gene Sturdevant of the Soil Conservation District, U. S. Department of Agriculture was most helpful. L. J. Bartelli, et al., (eds.), Soil Surveys and Land Use Planning. Madison, Wisc.: Soil Science Society of America and American Society of Agronomy, 1966, is a most useful and informative document for those unfamiliar with this field.

enrollment growth in the past. These benefits are in addition to the more general benefit to the CMA--that of stopping or (at least slowing irrational urban sprawl.

It is not common for school districts to take such active roles. But not many districts have available this kind of data, let alone the people who are able to generate such data and reduce them to productive knowledge.

CHAPTER III
GROWTH AND ENROLLMENT CHARACTERISTICS
FOR SCHOOL DISTRICT 509J
PAST AND PRESENT

The purpose of this chapter is to present pertinent information concerning growth and enrollment characteristics of the Corvallis School District. These data illustrate that District 509J has experienced a period of sustained increases in total school enrollment. In essence, the sustained pattern of growth for the school district corresponds generally to the period of population growth and economic expansion in the CMA. It should be noted that there has been a drop in enrollment as reported for the 1969-70 school year. There also appears to be a decline in the rate of growth in the Corvallis School District during the past seven years.

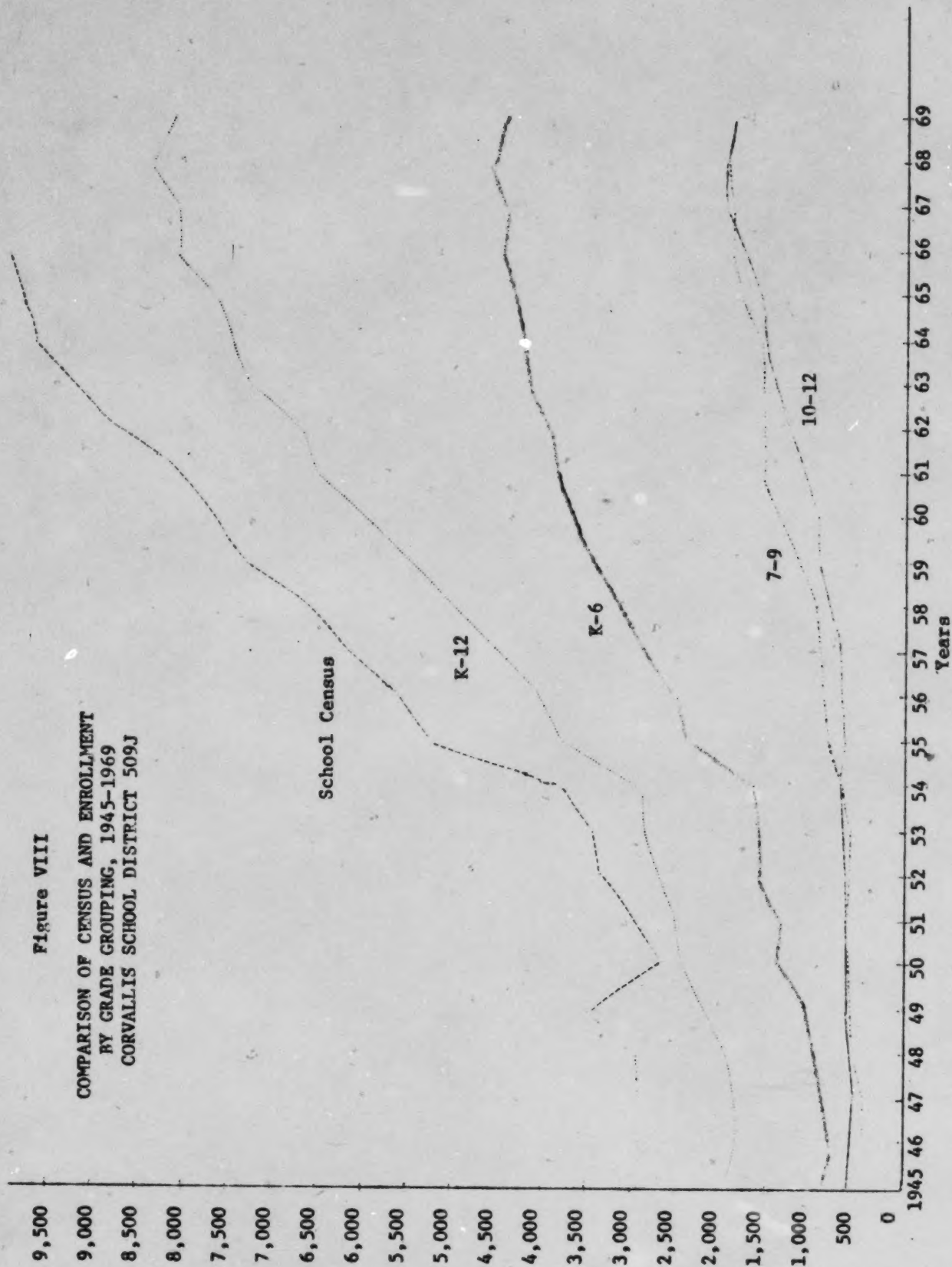
Past Enrollment

Figure VIII shows the growth of total student enrollment in District 509J from 1945 to 1969. The total student enrollment has been broken down by grade levels to illustrate the growth of each segment of the general student population. Furthermore, the census data over the corresponding years have been charted to provide a comparison between census figures for ages 4 to 19 and total school enrollment.

As mentioned above, the census data show a population growth comparable to total student enrollment, which exhibits a sustained growth pattern, reversed only in 1969-70 with a slight decline. Also, enrollment growth in grades K-6

Figure VIII

COMPARISON OF CENSUS AND ENROLLMENT
BY GRADE GROUPING, 1945-1969
CORVALLIS SCHOOL DISTRICT 509J



closely coincides with the sustained growth of total enrollment. However, enrollment patterns in grades 7-9 and 10-12 indicate that enrollment growth in these two grade groupings has been more moderate.

The extent to which the district's enrollment has changed by actual headcount and percentage is represented in Table 4. An examination of Table 4 shows that from 1945 to 1969 the total enrollment (K-12) has increased from 1,937 to 8,107 students. This represents a growth of 6,170 students or a 318.5 percent increase during this span of 25 years. The figures indicate that District 509J has experienced an increase in total student enrollment each year except for the decreases in 1946 and 1969. However, the percentage increase per year for total enrollment has varied from a high in 1955-56 of 30.1 percent to a low of 0.5 percent in 1967-68. During this span of 25 years the K-6 enrollment increased by a factor of approximately 5.1 times, whereas the 7-9 and 10-12 enrollments increased by only a factor of 3.5 and 3.3, respectively. This indicates that most of the total enrollment growth occurred in the K-6 grade groupings.

Several generalizations may be drawn from the data presented in Table 4. They are:

1. These data on past enrollment support the contention that the total student enrollment of District 509J experienced a sustained pattern of steady growth during the years 1946-1963.
2. From 1964 to 1969, the Corvallis School District has had relatively smaller percentage increases in total enrollment compared to those of earlier years.
3. The greatest growth in student enrollment for District 509J has occurred in the K-6 grade grouping.
4. The total district enrollment in terms of percentage increase or decrease has shown considerable variability during the period from 1945-1969.

Table 4

PAST ENROLLMENT, 1945-1969^a

Year	Total Students				Pupil Increase or Decrease				Percent of Increase or Decrease				
	K-6	7-9	10-12	Sp	K-12	K-6	7-9	10-12	K-12	K-6	7-9	10-12	K-12
1945-46	845	534	558	0	1,937								
1946-47	791	489	555	2	1,837	-54	-45	-3	-100	-6.4%	-8.4%	-0.5%	-5.2%
1947-48	831	470	540	0	1,841	40	-19	-15	4	5.1%	-3.9%	-2.7%	0.2%
1948-49	908	506	553	1	1,968	77	36	13	127	9.3%	7.6%	2.4%	6.9%
1949-50 ^b	1,080	521	605	0	2,206	172	15	52	238	18.9%	3.0%	9.4%	12.1%
1950-51	1,320	559	605	0	2,484	240	38	0	278	22.2%	7.3%	0.0%	12.6%
1951-52	1,359	578	634	0	2,571	39	19	29	87	3.0%	3.4%	4.8%	3.4%
1952-53	1,539	560	640	2	2,741	180	-18	6	170	13.2%	-3.1%	1.0%	6.6%
1953-54	1,659	552	672	0	2,883	120	-8	32	142	7.8%	-1.4%	5.0%	5.2%
1954-55	1,696	596	646	0	2,938	37	44	-26	55	2.2%	8.0%	-3.9%	1.9%
1955-56	2,394	769	660	0	3,823	698	173	14	885	41.2%	29.0%	2.2%	30.1%
1956-57	2,580	833	681	0	4,094	186	64	21	271	7.8%	8.3%	3.2%	7.1%
1957-58	2,866	947	699	0	4,512	286	114	18	418	11.1%	13.7%	2.6%	10.2%
1958-59	3,179	988	784	0	4,951	313	41	85	449	10.9%	4.3%	12.2%	9.9%
1959-60	3,446	1,186	903	12	5,547	267	198	119	596	8.4%	20.0%	15.2%	12.0%
1960-61	3,676	1,385	994	9	6,064	230	199	91	517	6.7%	16.8%	10.1%	9.3%
1961-62	3,840	1,552	1,119	9	6,520	164	167	125	456	4.5%	12.1%	12.6%	7.5%
1962-63	3,922	1,587	1,254	10	6,773	82	35	135	253	2.1%	2.3%	12.1%	3.9%
1963-64	4,195	1,603	1,451	12	7,261	273	16	197	488	7.0%	1.0%	15.7%	7.2%
1964-65	4,231	1,654	1,522	4	7,411	36	51	71	150	0.8%	3.2%	4.9%	2.1%
1965-66	4,350	1,789	1,614	16	7,769	119	135	92	358	2.8%	8.2%	6.0%	4.8%

Table 4 (Cont.)

PASZ ENROLLMENT, 1945-1969^a

Year	Total Students			Pupil Increase or Decrease			Percent of Increase or Decrease			
	K-6	7-9	10-12	Sp	K-12	K-6	7-9	10-12	K-12	K-12
1966-67	4,453	1,844	1,759	16	8,072	103	55	145	303	2.4%
1967-68	4,468	1,838	1,881	18	8,110	15	-6	122	38	0.3%
1968-69	4,572	1,908	1,902	34	8,416	104	70	21	306	2.3%
1969-70	4,346	1,851	1,830	20	8,107	-226	-57	-72	-309	-4.9%
										3.1%
										8.9%
										3.9%
										0.3%
										-0.3%
										6.9%
										0.5%
										1.1%
										3.8%
										-3.0%
										-3.8%
										-3.7%

^aEnrollment as of September 30 for each year, from school district records.
^bYear K started.

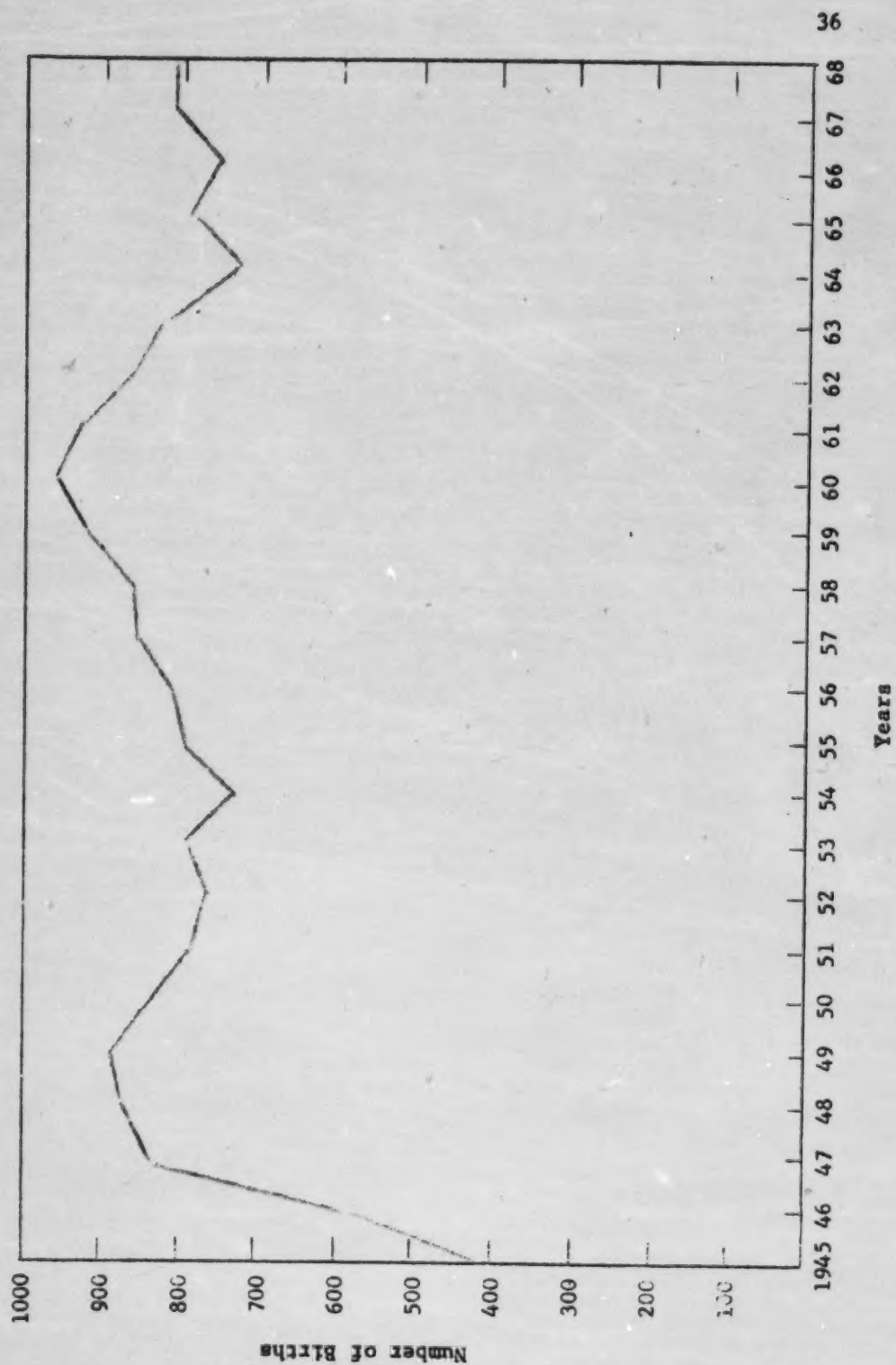
Data which indicate that the District 509J has recently experienced a relatively stabilized enrollment growth pattern are shown in Table 5. This table provides information concerning the average rate of percentage increase during selected time periods for the school district. Note that during the years 1945-1955 the average rate of percentage increase per year in enrollment was 9.7 percent; furthermore, in the eight years from 1955-1963 this rate of increase per year advanced to an average of 11.2 percent. However, during the last six years (1963-1969) the average rate of increase per year has fallen to 1.9 percent. This table also shows the percentage increase during these various time periods in terms of growth per grade grouping. The smaller percentage increases by grade groupings for 1963-69 illustrate the decline in the rate of growth in each of the grade groupings compared to the growth in the other two time spans.

Tables A-1 to A-4 in Appendix provide additional background information concerning past student enrollment for the District 509J from 1945 to 1969. These data are arranged so that the total student enrollment may be analyzed in terms of enrollments for individual grades (K-12) and several grade groupings (K-6, 7-9, 10-12, and K-12). The actual pupil increase or decrease and the percentage of change are listed at the bottom of each table.

Resident Births

Figure IX is a graphical representation of the number of resident live births in Benton County during the period 1945 to 1968. The highly irregular curve illustrates the extent to which the number of births have varied in this time span. The two high points in recorded county births were in 1948-49 and in 1960, whereas the three low points were in 1945, 1954, and 1964. This irregular pattern of county births contrasts sharply with the sustained growth pattern exhibited by the district's enrollment from 1945 to 1968 (Figure VIII).

Figure IX
BENTON COUNTY BIRTHS, 1945-1968



Another illustration of the variability in the number of resident Benton County births per year is shown in Table 6. This table indicates the increase or decrease in number and percentage of county births during the years 1945 to 1968. The large increases in 1946 and 1947 in county births correspond to the large increases in enrollment at Oregon State University during this period.

Generally, a substantial reduction in the annual number of county births as indicated in Table 6 during certain years may result in a corresponding decrease in the first-grade enrollment six years later.

Progression Ratios

The progression ratio denotes the relationship between the number of pupils in a given grade and the number of pupils in the succeeding grade the next year. A progression ratio of 1.00 indicates that the enrollment in a given year was equal to the enrollment for the same group in the preceding year.

The basic equation used in computing the progression ratio is as follows:

$$\text{Progression ratio} = \frac{\text{Enrollment in grade } x \text{ in a given year}}{\text{Enrollment in grade } (x-1) \text{ the previous year}}$$

The importance of examining progression ratios for the Corvallis School District is to gain some understanding of the in-migration or out-migration of students that has occurred in the past. In general terms, a progression ratio greater or less than 1.00 provides a measure of in-migration or out-migration, respectively. However, it should be noted that this ratio also reflects deaths, retentions at various grade levels, dropouts, and transfers to and from private

Table 6

RESIDENT BIRTHS IN BENTON COUNTY, OREGON^a

Year	Total	Increase or (Decrease)	Percent of Increase or (Decrease)
1945	416		
1946	591	175	42.1%
1947	831	240	40.6%
1948	882	51	6.1%
1949	882	0	0.0%
1950	836	(-46)	(-5.2%)
1951	778	(-58)	(-6.9%)
1952	764	(-14)	(-1.8%)
1953	781	17	2.2%
1954	731	(-50)	(-6.4%)
1955	784	53	7.3%
1956	801	17	2.2%
1957	852	51	6.4%
1958	853	1	0.1%
1959	919	66	7.7%
1960	961	42	4.6%
1961	928	(-33)	(-3.4%)
1962	860	(-68)	(-7.3%)
1963	827	(-33)	(-3.8%)
1964	727	(-100)	(-12.1%)
1965	785	58	7.9%
1966	752	(-33)	(-4.2%)
1967	803	51	6.8%
1968	805	2	0.2%

^aData from the Oregon State Board of Health, Vital Statistics Section.

schools in the district. Nevertheless it is assumed that the largest element, by far, causing increases or decreases in the progression ratios for the district is migration. Therefore, such an examination should give an indication of migratory trends due to student mobility.

Table 7 shows the progression ratios calculated for grades 1-12 during the period 1962-1968. Also shown is the mean progression ratio, which is computed by averaging all seven ratios. Statistically, ratios cannot be averaged. However, if the denominators of the numbers involved are similar in magnitude, the results will be sufficiently accurate for the purpose intended. The data in this table indicate that District 509J has experienced during this time an influx of students which is reflected by the number of progression ratios which exceed 1.00. Evidently, the amount of student in-migration which has counteracted the decrease in birth rates explains the sustained growth in total student enrollment in the district during 1962-1968.

Enrollment Characteristics by Grade

Student enrollment by individual grades has been varied in the district during the time period, 1945-1969. This point is illustrated by Figures X, XI, XII, XIII, and XIV, which show the enrollment characteristic of District 509J at 5-year intervals: 1950, 1955, 1960, 1965, 1969. Enrollment figures by grade indicate that the enrollment pattern has become more rectangular in form. In other words, the student enrollment for Corvallis is now fairly evenly distributed over the K-12 grade levels. Enrollment for each grade is between 573 and 650 students, with no enrollment bulge at any grade level.

This concludes the examination of past enrollment data for District 509J. The next chapter deals with the development of the projection model.

Table 7

PROGRESSION RATIOS FOR ENROLLMENTS
CORVALLIS SCHOOL DISTRICT, 1962-1969

Grades	1962-63	1963-64	1964-65	1965-66	1966-67	1967-68	1968-69	Mean Progression Ratio
1-2	1.040	0.937	0.955	0.980	0.980	1.015	0.959	0.981
2-3	1.036	0.965	0.980	1.034	0.992	0.978	0.957	0.992
3-4	1.066	1.019	1.014	0.972	1.000	1.038	0.957	1.009
4-5	1.021	0.978	1.031	0.995	1.002	0.962	0.926	0.988
5-6	1.026	0.990	1.011	0.990	0.984	1.060	0.970	1.004
6-7	1.058	1.018	1.048	1.074	1.003	1.032	0.965	1.028
7-8	1.033	0.992	1.036	1.026	1.002	1.055	0.966	1.016
8-9	1.044	1.070	1.141	1.102	1.045	1.071	1.014	1.070
9-10	0.998	0.982	0.982	1.043	0.987	1.037	0.957	0.998
10-11	0.935	0.944	1.006	1.038	0.938	1.022	0.960	0.978
11-12	1.030	0.953	0.998	1.036	0.972	0.988	0.907	0.983

Figure X. ENROLLMENT BY GRADE - 1950

41

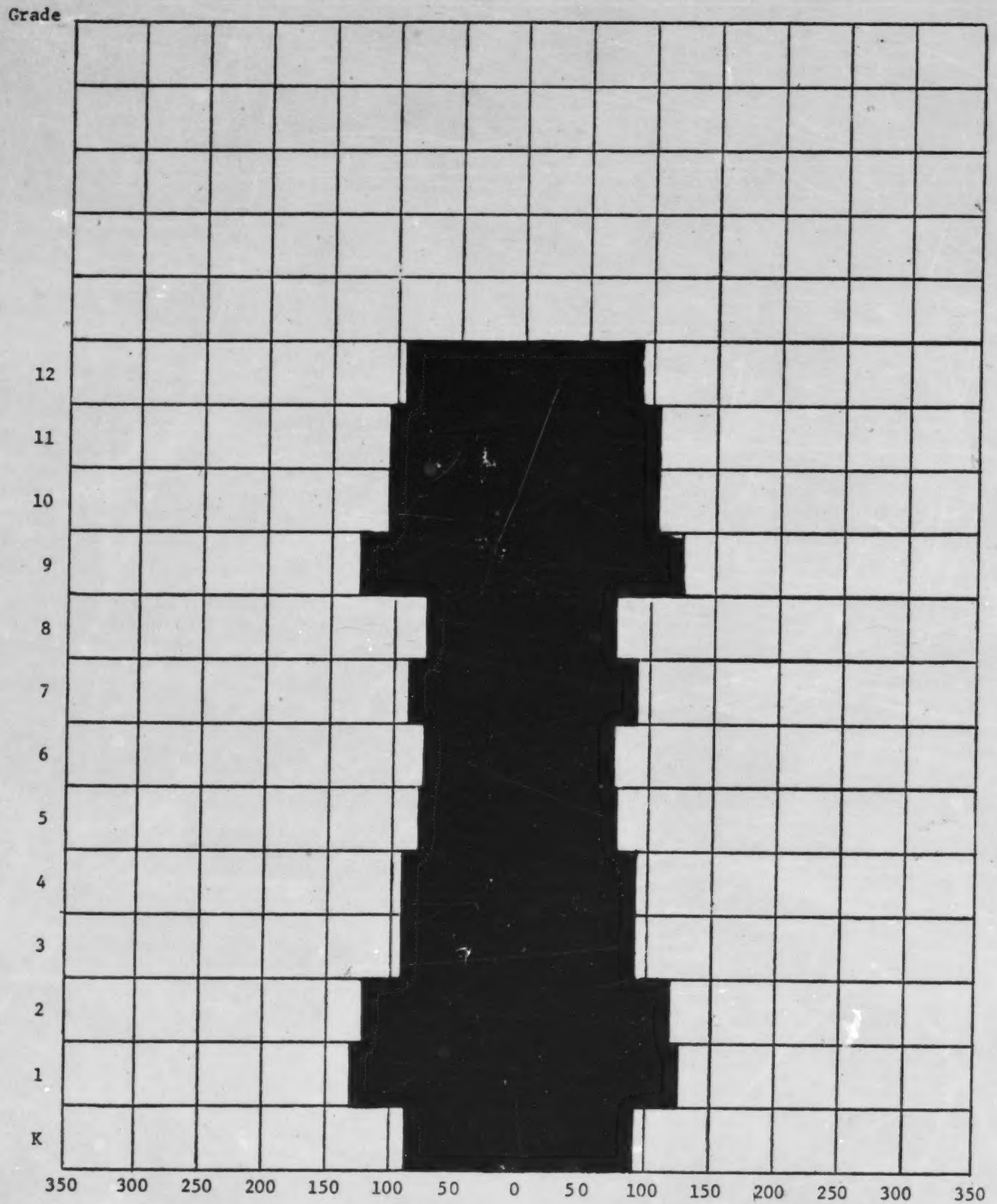


Figure XI. ENROLLMENT BY GRADE - 1955

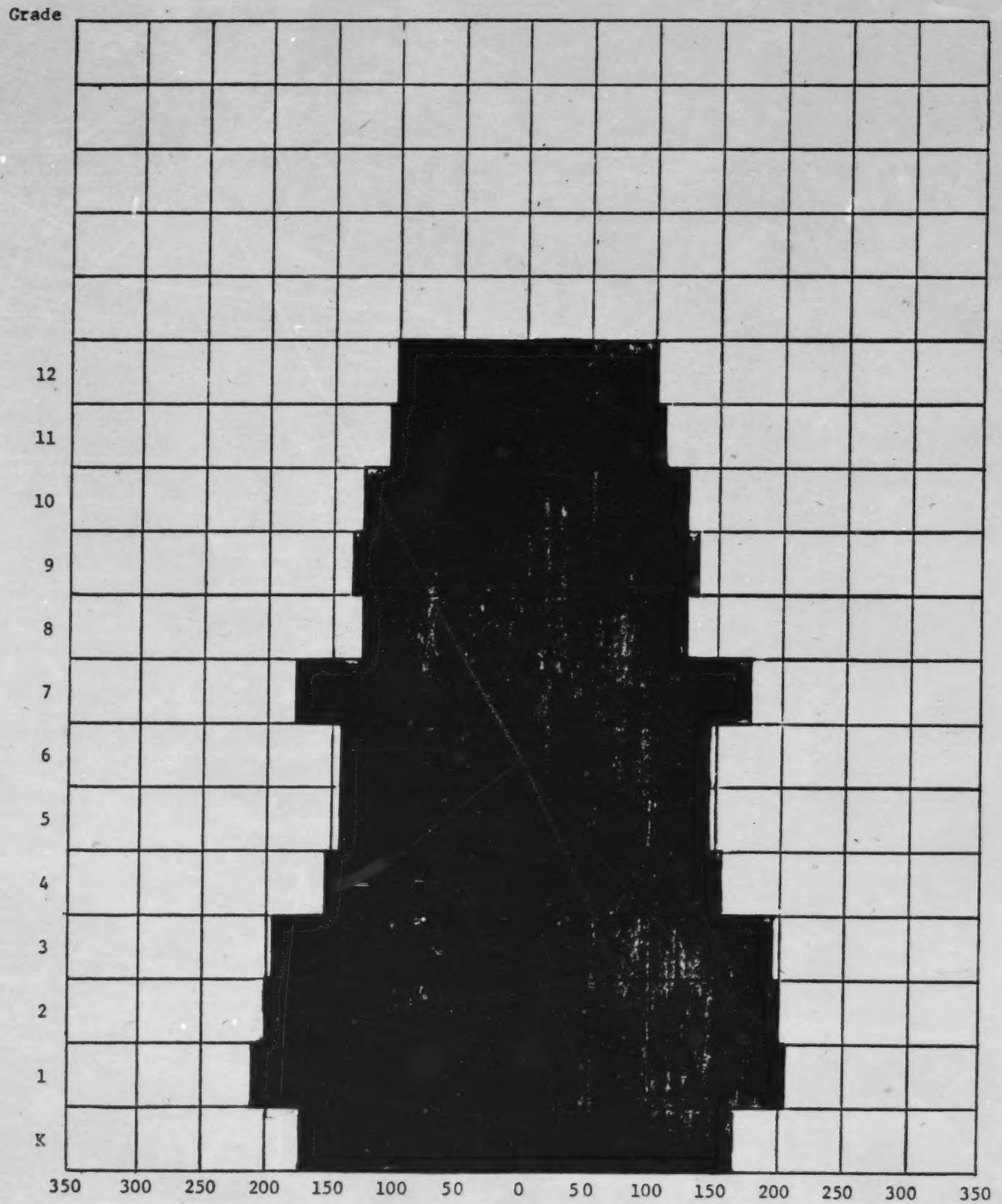


Figure XII. ENROLLMENT BY GRADE - 1960

43

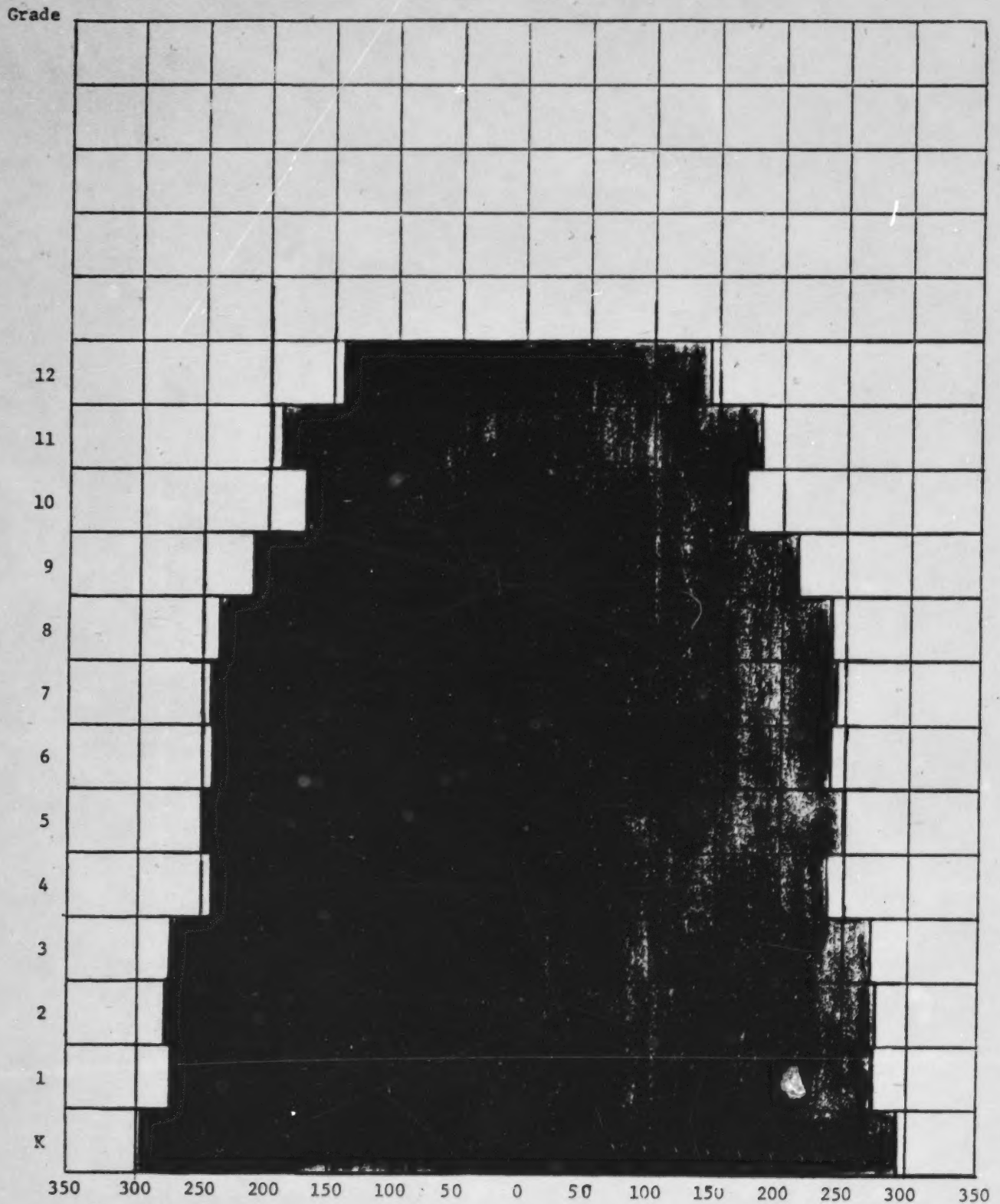


Figure XIII. ENROLLMENT BY GRADE - 1965

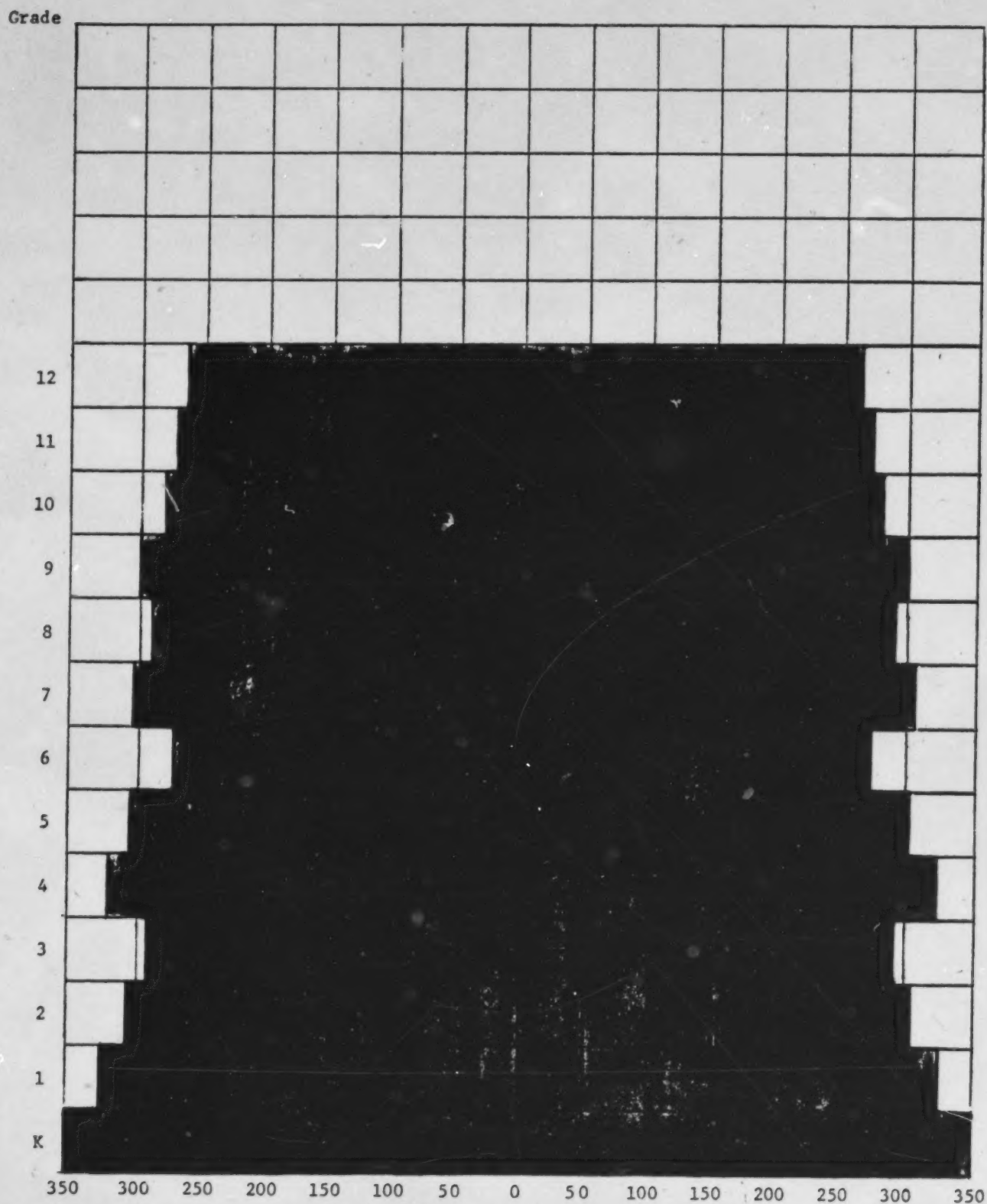
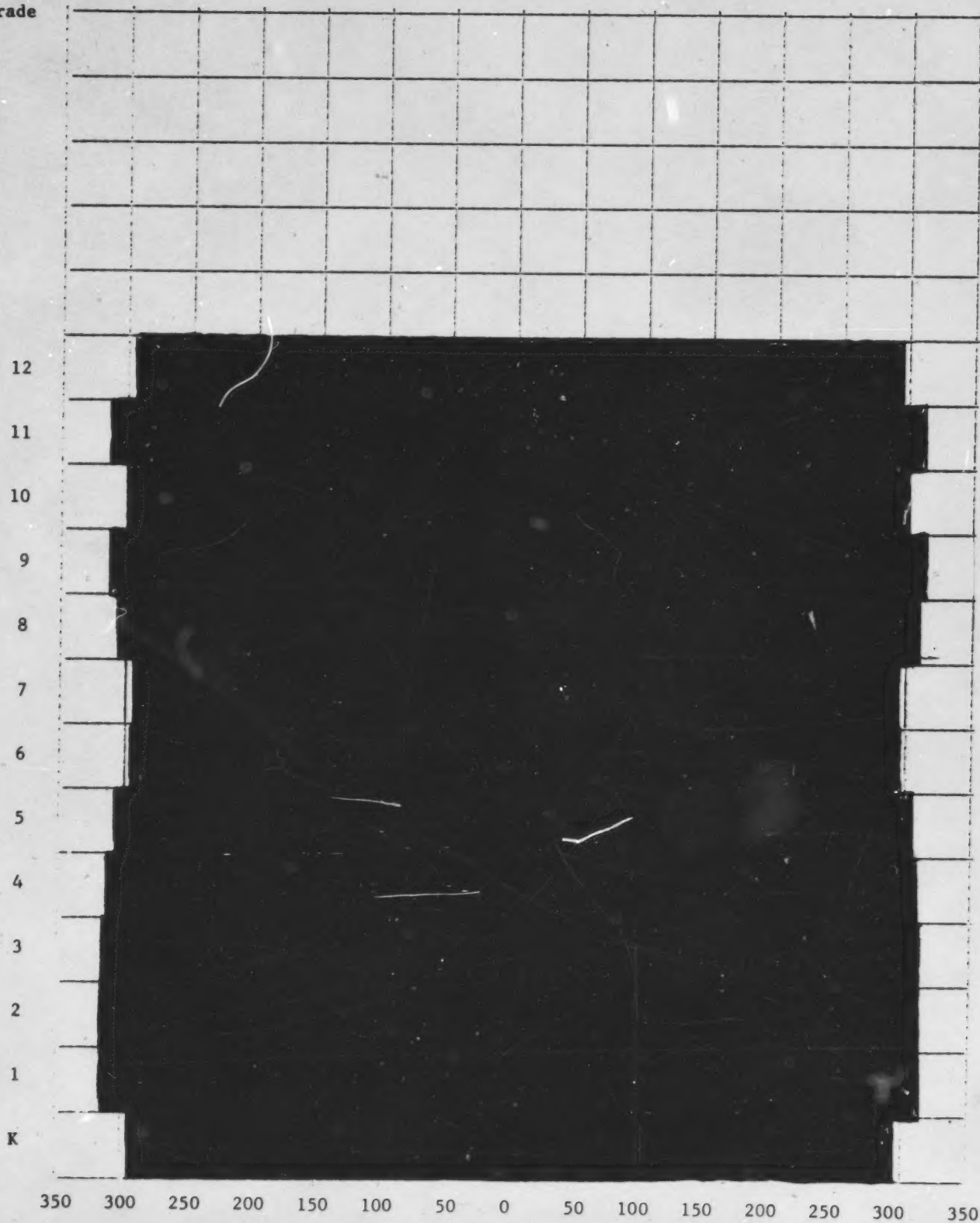


Figure XIV. ENROLLMENT BY GRADE - 1969

45

Grade



CHAPTER IV

DEVELOPMENT OF THE ENROLLMENT PROJECTION MODEL

Background to the Problem

An examination of literature pertinent to projecting student enrollments as well as some sources related to the estimation of general population growth (or decline) revealed several points that should be examined briefly in this chapter before going on to the specific problem of the formulation of an enrollment projection model for District 509J.¹

The enrollment of a school district is embedded in a complex web of social, economic, and political factors which characterize a given geographic area. The very physical condition of the land of that area is a part of this complex web. The strong impression conveyed throughout the literature² is that increases or decreases in enrollment (or lack of either) in a given area are "caused" by this complex web of factors as these factors interrelate with

¹See bibliography at the end of Chapter IV. Since the intent of the next few pages is to summarize major points from these sources, the usual notation system will be suspended unless a direct quote is given or a particular point comes from one source only.

²Another strong impression one gains from the material written since the late 1940's and dealing specifically with enrollment projection techniques is that the authors generally are responding to the massive increases in school population. It may be fair to say that such massive increases in short time spans may be behind much of the interest displayed in investigating enrollment projection techniques.

one another.³ The more dynamic these factors are (the greater the interaction) the less likely it is that enrollment in a given area will remain stable.

It follows that when a projection of enrollment is contemplated by a school district, the process should include the widest possible analysis of the district. The more factors that can be isolated and examined the more reliable the projection is likely to be.⁴ Even so, the degree of reliability appears to fall (and fall sharply) as a projection is pushed further into the future. Caution in the use of a projection is always a wise injunction and extreme caution should be taken with a projection beyond five years.⁵

In addition, there seems to be general support for the notion that the smaller the geographic area the greater the likelihood of inaccuracy in enrollment projection (this appears to be the case in the projection of

³It is not a matter that can be explored in this paper, but the operational assumption that these factors "cause" enrollment to change may be only partially true. Instead of showing a linear relationship where change in the factors leads to changes in enrollment, it might better be said that change in the factors leads to changes in enrollment which in turn lead to further changes in the factors of the complex web. This suggests a circular relationship. The question of the proportion of the total population enrolled in school in any given area at any given time is itself a factor in the complex web.

⁴It is intended that this analysis and examination should include both statistical and non-statistical procedures. Several authors in essence suggest the tempering of mathematically produced projections in light of a careful analysis of prevailing social, economic, political conditions.

⁵The reason for caution relates to the underlying assumptions in any projection technique (seldom stated)--that the future will be similar to the past and that no sharp departures from past patterns will take place. Put somewhat differently, variations in the environment are reasonably orderly and predictable (i.e., a housing development is not built overnight). One seldom assumes a catastrophe--man-made or natural. Even small "disasters" are seldom assumed but may be predictable by persons sensitive to what's going on in a given area. Just as new industry is not built overnight, so established industry does not close down or cut production drastically without prior warning.

population as well). Enrollment projections are better accomplished for a school district as a whole than for one attendance area within the district. It holds that one would have a more reliable projection of school enrollment by examining many districts in total (i.e., all those in the state of Oregon) than by examining one district.⁶

There appear to be two initial problems in the construction of an enrollment projection model (this assumes that the rationale for making the effort has been established). The first is the identification of a comprehensive list of discrete variables that can be drawn from the complex web of social, economic, political, and physical factors for a given area (i.e., school district or metropolitan area). This does not appear to be as critical, however, as the second and related problem--obtaining usable data pertaining to each of the variables. It is quite clear from several of the sources cited in the bibliography that lack of adequate record-keeping over long periods of time is a major stumbling block in building a multivariable enrollment projection model. Some agencies that keep suitable records are not inclined to allow access to them by outsiders.

There is, in addition, the problem of adapting various records to a common base (i.e., one agency will keep records on the city, another on the county level, neither of which conforms to the geographic area covered by the

⁶A major reason for this is the mobility of the general population and especially that part of the population that is of child-bearing age. The wider the geographic area the more the effect of mobility is decreased. Hence, in principle, at least, the effect of the mobility factor on a projection of a given segment of the general population should be nearly nonexistent using the whole of the United States as a context.

school district). The various sources suggest that the most adequate⁷ and accessible records are kept by educational institutions, especially school districts (i.e., enrollments by grade, by school on a yearly basis) and by certain state agencies (i.e., motor vehicle registrations, bank deposits, and the like).

Of the many variables discussed in the sources reviewed, the set of variables grossly labeled as "housing" is suggested as being a most fruitful set of variables to examine in a given area over a given period of time. The stumbling block most often is the lack of adequate records. To extract usable data from those records that are kept often would require a very large investment in time. These kinds of problems are the reason several authors urge school districts to keep rather comprehensive data banks on at least the area that the district covers. However, the feasibility of building such data banks would be questionable in most districts.

Difficult as the question of examination of housing may be for a given community, it is still considered a major factor when discussing estimates of future enrollments. Notions of cost and size (number of rooms) per dwelling appear to provoke the greatest discussion. The assumptions appear to be that there is a predictable relationship between cost and size of a dwelling and the number of children living in the dwelling.⁸

⁷"Adequate" in this case simply means the keeping of actual figures (as opposed to extrapolations or estimations) on a regular basis in a consistent form over a long period of time.

⁸The Bell system relies on a variation of this assumption in estimating current population of a given community. The Bell system also appears to rely heavily on school enrollments to estimate general population in a given area. See: Pacific Northwest Bell Telephone Company. Population and Household Trends in Washington, Oregon and Northern Idaho. Chapter III, "Components of Population Growth," Appendix II, "Technical Notes." Business Research Division of Bell, March, 1967.

One source⁹ suggests that new housing (i.e., a housing development) does not deliver the maximum impact of children to a school district for five to ten years.

Several sources also suggest that school districts can encourage housing development by constructing school buildings in relatively sparsely populated areas. Often the assumption is made by the district that it is "getting the jump on things" when, in fact, such school construction may speed up housing expansion in the area where the school is built.

Selection of Variables

With this general background, it is now possible to move into the specific area of the project contracted between District 509J and the Bureau of Educational Research. The next two sections of this chapter deal with efforts to build a multifactor enrollment model. The last section of the chapter describes the technique actually employed.

As suggested earlier, a nation-wide survey of selected agencies was conducted to determine whether others concerned with the same type of problem had developed any more elaborate method of enrollment projection using variables other than county birth and actual school enrollment or the like. Few were found, and of those a Monte Carlo model which incorporates the use of

⁹George J. Greenawalt. Predicting School Enrollments. Cambridge, Massachusetts: New England School Development Council, 1966. This same study suggests there is a "housing cycle" covering many years which may include periods of no, few and many children per dwelling of school age, eventually returning to no children per dwelling. This particular notion may have greater application in large highly urbanized areas.

probability statistics in a computer program deserves particular mention.¹⁰ This model had not yet been adequately field tested to determine its effectiveness.

To aid in the selection of relevant factors, the research team conducted various interviews with a number of individuals from business, governmental, and educational organizations, some of whom are directly concerned with forecasting population.

One of the initial interviews was with the staff of the Corvallis Planning Office, where such information as the Corvallis Area Transportation Study (see footnote 7, Chapter II), projected land-use information, census data for the area, and other similar items were studied. The planning staff, being familiar with the area, was able to suggest a number of individuals who could possibly contribute impressions and information pertinent to the study. Through the auspices of the planning office, interviews were arranged with the Corvallis Chamber of Commerce, the local newspaper editor, power companies, realtors, land titles offices, the post office, the banks, and the telephone company. In addition, a number of other contacts were made including the district telephone headquarters in Portland, the Linn-Benton Intermediate Education

¹⁰Mary Griffin and John Schmitt, A Monte Carlo Model for the Prediction of Public School Enrollments, a report presented to the 1966 Research Convocation of the Educational Research Association of New York State and the New York State Education Department, Albany, New York, November 14, 1966. To quote the authors of this report as to the meaning of the term "Monte Carlo"; "The Monte Carlo Method was developed at the Los Alamos Research Center during World War II as a means of simulating the bombardment of uranium atoms with neutrons. Basic to the method is the use of random numbers to determine which of the many possible values of an uncertain variable is to be used in simulating the operation of the system--system being defined to include any process, procedure, operation or technique. By simulating system operation many times, it is possible to develop a distribution of probable outcomes the accuracy of which will depend on the accuracy with which the distributions of the original variable factors have been determined or estimated. 'Monte Carlo' was originated as a code name for the process and nothing more, but it has survived thousands of commercial and industrial applications, even though it tells little about the process and can be misleading."

District, the State of Oregon Banking Commission and State Department of Motor Vehicles, Center for Population Research and Census located at Portland State University, Oregon State University, the Bureau of Business and Economic Research and the Bureau of Governmental Research on the University of Oregon campus, Albany Chamber of Commerce, and the employment office of American Can Company at Halsey. An automobile tour was taken by the members of the research team, accompanied by a staff member of the planning office, to familiarize themselves with the topography of the CMA. The interviews, topographical surveys, and other investigations provided the team with the opportunity to become acquainted with the area on a first-hand basis. On the assumption that the project should take in as much information as possible, the team sought data about the CMA other than those things intended for testing as predictor variables in the projection model.

After analysis of the problem, a number of variables which were assumed to be factors influencing the total student enrollment in District 509J were selected. In several instances, specific variables were not examined because, for one reason or another, data could not be obtained.

The original list of variables (28) selected for comparison with District 509J enrollments can be divided into four basic categories--two of these categories unique to a university community.¹¹ These categories are Oregon State University enrollment; Oregon State University, other variables; general demographic variables; and various economic variables for CMA. The following open table gives specific variables for each category. (See Appendix B for actual yearly figures.)¹²

¹¹See Chapter II for the general rationale behind the selection of these two sets of variables for CMA.

¹²One factor that was not examined for CMA was non-public school enrollment. The two such schools in the CMA have at present a combined enrollment of slightly more than 200 students ranging over grades 1-8.

Oregon State University Student Enrollment, 1947-48 through 1968-69

Fall $\begin{cases} \rightarrow \text{Undergraduate} \\ \rightarrow \text{Graduate} \\ \rightarrow \text{Total} \end{cases}$

Winter $\rightarrow$ Total

Spring $\begin{cases} \rightarrow \text{Undergraduate} \\ \rightarrow \text{Graduate} \\ \rightarrow \text{Total} \end{cases}$

Oregon State University-Other Variables, 1944-45 through 1967-68

Grant Expenditures
 Wage and Salary Expenditures (Total)
 Instructional Salary Expenditures (only)
 - - - - -

Graduate Assistants and Fellows (FTE)
 - - - - -

Academic Instructional Staff (FTE)

Professors
 Associate Professors
 Assistant Professors
 Instructors
 Instructional Staff (Total)

General Demographic Variables

Oregon Population (federal and state sources) 1945-1968
 Benton County Population 1945-1968
 Corvallis Population 1956-1968
 Albany Population 1956-1968
 Benton County School Age Census (4-19)^a, 1944-45 through 1966-67
 Benton County Births 1954-1963
 Student In-migration, 1945-46 through 1967-68
^bRegistered Voters

Various Economic Variables for CMA

Corvallis Bank Deposits 1946-1968
 Albany Bank Deposits 1946-1968
 Total Bank Deposits 1946-1968
 Benton County Motor Vehicle Registration (Passenger) 1946-1968
 Benton County Motor Vehicle Registration (Total--all) 1946-1968
^bCorvallis Area Telephone Installations $\begin{cases} \rightarrow \text{Public} \\ \rightarrow \text{Utilities} \end{cases}$
^bWater Meter Connections
^bPower Company Connects and Disconnects
^bPost Office $\begin{cases} \rightarrow \text{Receipts} \\ \rightarrow \text{Volume of Mail} \\ \rightarrow \text{Increase in Addresses} \end{cases}$
^bBuilding Permits $\begin{cases} \rightarrow \text{Size (number of rooms)} \\ \rightarrow \text{Estimated Building Cost Per Dwelling} \end{cases}$

^aIncludes students from Linn County attending Corvallis District 509J.

^bNot examined.

Research Design

Utilizing the systems analysis approach, the research team formulated certain relevant questions which they felt would provide pertinent data. The purpose for posing such questions was to focus the inquiry on specific areas to be examined which were assumed to be related to the problem of developing an enrollment projection model. Consequently, the following general questions became the focal points on which the research team concentrated its full efforts:

1. What is the influence of selected types of variables, such as economic factors, demographic factors, Oregon State University enrollments, and other selected variables on the total number of students enrolled in the Corvallis School District?
2. What statistical relationships, if any, exist between these selected variables and past total student enrollments for the Corvallis School District?
3. What type of computerized program using selected variables is most practical for providing accurate student enrollment estimates for the Corvallis School District?

In essence, the research team proposed to develop an enrollment projection model which would provide estimates for future student enrollments in District 509J. The research design selected to achieve this goal was based on two considerations which determined the basic direction of this study.

In the first place, it was assumed that by analysis of selected variables a multiple regression equation¹³ could be built that would predict possible

¹³George A. Ferguson, Statistical Analysis in Psychology and Education (New York: McGraw-Hill Book Company, 1966), pp. 388-402.

variations in the student growth patterns for the district. The theoretical assumptions on which the multiple regression equation is founded will not be discussed in this report. However, the main idea behind the multiple regression equation is that by selecting an appropriate combination of independent variables an equation can be computed which will successfully predict the dependent variable. Essentially, the research team was concerned with selecting a combination of independent variables (i.e., economic, demographic, Oregon State University, and other variables) and by statistical analysis develop a multiple regression equation which would provide estimates of the dependent variable (district total student enrollment) for a period of years into the future.

In the second place, if the plan discussed above did not prove successful, it was arbitrarily decided by the research team to pursue an alternative approach. Basically, this approach was to select one or two key variables (determined by the statistical analysis of all variables) and build a projection model based on these specific variables. Actually, as will be presented later in the report, this alternative plan became the major focus on which the research team formulated a method for estimating future district student enrollments.

The research design constructed to provide a statistical analysis of the selected variables was composed of four basic phases. These phases are presented in outline form to indicate the steps taken by the research team to develop an enrollment projection model for District 509J. The actual data obtained from the statistical analysis of the relationship between variables are reported in the next section of the report.

Phase One. Calculation of Correlational Coefficients

The emphasis in this phase of the research design was to examine the statistical relationships, if any, between the selected independent variables (economic, demographic, and Oregon State University data) and the dependent variable (District 509J total student past enrollments). Furthermore, correlational coefficients were calculated to measure any relationships which might exist among the various independent variables.

Phase Two. Computing Time Lag Correlations

This phase was designated to explore any possible relationship between the independent variables and the dependent variable (past total student enrollments) which may depend upon a lag in time. For example, an increase in residential construction will not affect school enrollments until the time of completion and occupancy, which covers a span of time. The research team arbitrarily selected time lags of one, two, three, four, and five years as reasonable spans of time over which the relationship between the selected variables and past total student enrollments should be examined.

Phase Three. Building a Multiple Regression Equation

The purpose of this phase was to statistically produce a multiple regression equation which would provide estimates of future student enrollments. It should be noted that the success of this phase depended entirely upon the analysis of the relationships between the selected variables and past Corvallis total student enrollment.

Phase Four. Development of Enrollment Projection Model

As has been discussed, the research team considered that two approaches to developing an enrollment projection model were possible depending upon the

results of the statistical analysis of the selected variables. Therefore, this phase of the study was designed such that the original plan (multiple regression equation) or the alternative (one or two variable projection models) could be utilized to formulate an enrollment projection model for District 509J.

The results of the statistical analysis and the plan chosen by the research team are presented in the next two sections of this chapter.

Statistical Analysis of Data

The purpose for choosing variables that were examined statistically was to determine if any relationship existed between these independent variables and the dependent variable--the district's enrollment. One statistical process of discovering and measuring functional relationships involves an analysis of variables to ascertain the extent to which the variables are correlated; that is, the extent to which they move together or away from each other. If the values taken by the dependent variable depend upon the values of one or more independent variables, a functional relationship is present.

There are various methods of computing correlation, but the method utilized in this study was the product-moment method, which is signified by the symbol r , also known as Pearson- r after its originator.¹⁴ Measures of correlation are conventionally defined to take values ranging from -1.0 to +1.0. A value of +1.0 describes a perfect positive relation. In other words, a large amount of one variable is found with a large amount of the other or a small amount of one with a small amount of the other, and these are in direct proportion throughout the ranges of their distribution. A correlation of -1.0 is just as significant as a +1.0 but

¹⁴Ibid., p. 109.

the proportions are in reverse: a large amount of one variable is found with a small amount of the other. For a .00 correlation, no relationship exists between the independent and dependent variables.

Table 8 indicates the nature of the relationship between the 28 selected independent variables and the one dependent variable--total Corvallis district enrollment (K-12). This table shows the correlation coefficient between the variables over selected spans of time for the Corvallis School District. An analysis of these data reveals generally high Pearson-Product correlations.

Table 8

PEARSON-PRODUCT CORRELATION COEFFICIENTS
BETWEEN SELECTED VARIABLES AND DISTRICT 509J TOTAL ENROLLMENTS^a
DURING SEVERAL TIME PERIODS

Variable	Correlation Coefficient							
	24 years 1945-69		10 years 1959-69		5 years 1960-65		5 years 1965-69	
	r	p	r	p	r	p	r	p
<u>Oregon State University Student Enrollment</u>								
Fall: Undergraduate	-.21	--b	-.65	.05	.95	.02	-.65	--b
Graduate	.93	.001	.97	.001	.97	.01	.98	.01
Total	.83	.001	.97	.001	.96	.02	.99	.01
Winter: Total	.88	.001	.97	.001	.96	.02	.98	.01
Undergraduate	.87	.001	.97	.001	.98	.01	.97	.01
Graduate	.94	.001	.98	.001	.99	.001	.97	.01
Total	.89	.001	.97	.001	.98	.01	.97	.01
<u>Oregon State University--Other Variables</u>								
Grant Expenditures	.87	.001	.95	.001	.93	.05	.86	.20
Wage Expenditures	.94	.001	.95	.01	.96	.02	.94	.10
Graduate Assistants and Fellows (FTE)	.95	.001	.97	.001	.99	.001	.93	.05
FTE of Academic Instructional Staff								
Professors	.92	.001	.94	.001	.85	.10	.96	.01
Associate Professors	.96	.001	.95	.001	.99	.01	.90	.05
Assistant Professors	.94	.001	.93	.001	.69	--b	.92	.05
Instructors	-.34	.20	-.85	.01	-.99	.01	.32	--b
Instructional Staff (Total)	.76	.001	.24	--b	.94	.02	-.49	--b

^aIncludes kindergarten.

^bNot significant.

r represents correlation coefficient.

p represents level of significance.

Table 8 (Cont.)

PEARSON-PRODUCT CORRELATION COEFFICIENTS
BETWEEN SELECTED VARIABLES AND DISTRICT 509J TOTAL ENROLLMENTS^a
DURING SEVERAL TIME PERIODS

Variable	Correlation Coefficient					
	24 years 1945-69		10 years 1959-69		5 years 1960-65	
	r	p	r	p	r	p
<u>General Demographic Variables</u>						
Oregon Population (Estimates) Federal	.95	.001	.93	.001	.98	.01
Oregon Population (Estimates) State	.95	.001	.97	.001	.98	.01
Benton County Population	.97	.001	.96	.001	.96	.01
Corvallis Population	.97	.001	.98	.001	.98	.01
Albany Population	.92	.001	.97	.001	.95	.02
Student In-migration ^c						
<u>Various Economic Variables for CHA</u>						
Corvallis Bank Deposits	.92	.001	.90	.001	.97	.01
Albany Bank Deposits	.92	.001	.88	.01	.99	.01
Total Bank Deposits (Corvallis and Albany)	.92	.001	.90	.01	.98	.01
Benton County Motor Vehicle Registration (Passenger)	.97	.001	.97	.001	.95	.02
Benton County Motor Vehicle Registration (Total--all)	.97	.001	.98	.001	.95	.02

^aIncludes Kindergarten.

^bNot significant.

^cStudent In-migration data were not available at the time these correlations were calculated.

r represents correlation coefficient.

p represents level of significance.

Tables 9 and 10 show correlation coefficients which were obtained by time-lagging the independent variables. The time-lagging of the independent variables (i.e., OSU Instructional Staff, etc.) in comparison with the dependent variable (District 509J total enrollment K-12) was accomplished by calculating correlation coefficients for each time lag of 1, 2, 3, 4, and 5 year steps. For example, the following open table illustrates this technique for the two time spans of 24 and 10 years examined in this study:

<u>24-Year Time Lag (1945-68)^a</u>			
<u>Independent Variable</u>	<u>Dependent Variable</u>	<u>Time Lag</u>	<u>Correlation Coefficient</u>
OSU Instructional Staff (Total)	District 509J Total Enrollment		
1944 to 1967	1945 to 1968	1 year	.95
1943 to 1966	1945 to 1968	2 years	.95
1942 to 1965	1945 to 1968	3 years	.94
1941 to 1964	1945 to 1968	4 years	.93
1940 to 1963	1945 to 1968	5 years	.94

^aData before 1944 were not used in these calculations.

<u>10-Year Time Lag (1959-68)</u>			
<u>Independent Variable</u>	<u>Dependent Variable</u>	<u>Time Lag</u>	<u>Correlation Coefficient</u>
OSU Instructional Staff (Total)	District 509J Total Enrollment		
1958 to 1967	1959 to 1968	1 year	.93
1957 to 1966	1959 to 1968	2 years	.93
1956 to 1965	1959 to 1968	3 years	.93
1955 to 1964	1959 to 1968	4 years	.94
1954 to 1963	1959 to 1968	5 years	.96

Table 9

PEARSON-PRODUCT CORRELATION COEFFICIENTS
BETWEEN SELECTED VARIABLES (TIME-LAGGED) AND DISTRICT 509J TOTAL ENROLLMENTS^a
DURING THE YEARS 1944-45 TO 1967-68

Variable	Correlation Coefficient									
	1 Year Steps		2 Year Steps		3 Year Steps		4 Year Steps		5 Year Steps	
	r	p	r	p	r	p	r	p	r	p
<u>Oregon State University Student Enrollment</u>										
Undergraduate										
Fall: Graduate	-.11	-.b	.04	-.b	.25	-.b	.67	.01	.57	.02
Graduate	.91	.001	.90	.001	.88	.001	.86	.001	.84	.001
Total	.86	.001	.84	.001	.81	.001	.76	.001	.69	.001
Winter: Total	.86	.001	.84	.001	.81	.001	.76	.001	.69	.001
Undergraduate										
Spring: Graduate	.84	.001	.81	.001	.77	.001	.71	.001	.64	.001
Graduate	.93	.001	.91	.001	.89	.001	.87	.001	.85	.001
Total	.87	.001	.84	.001	.81	.001	.76	.001	.69	.001
<u>Oregon State University--Other Variables</u>										
Grant Expenditures	.85	.001	.82	.001	.79	.001	.76	.001	.76	.001
Wage Expenditures	.93	.001	.93	.001	.93	.001	.93	.001	.93	.001
Graduate Assistants and Fellows (FTE)	.94	.001	.92	.001	.90	.001	.86	.001	.82	.001
FTE of Academic Instructional Staff										
Professors	.91	.001	.90	.001	.88	.001	.87	.001	.84	.001
Associate Professors	.95	.001	.96	.001	.96	.001	.95	.001	.94	.001
Assistant Professors	.94	.001	.94	.001	.94	.001	.92	.001	.92	.001
Instructors	-.30	.20	-.27	-.b	-.21	-.b	-.17	-.b	-.13	-.b
Instructional Staff (Total)	.95	.001	.95	.001	.94	.001	.93	.001	.94	.001

^aIncludes kindergarten.

^bNot significant.

r represents correlation coefficient.

p represents level of significance.

Table 9 (Cont.)

PEARSON-PRODUCT CORRELATION COEFFICIENTS
BETWEEN SELECTED VARIABLES (TIME-LAGGED) AND DISTRICT 509J TOTAL ENROLLMENTS^a
DURING THE YEARS 1944-45 TO 1967-68

Variable	Correlation Coefficient									
	1 Year Steps		2 Year Steps		3 Year Steps		4 Year Steps		5 Year Steps	
	r	p	r	p	r	p	r	p	r	p
<u>General Demographic Variables</u>										
Oregon Population (Estimates) Federal	.95	.001	.96	.001	.96	.001	.96	.001	.96	.001
Oregon Population (Estimates) State	.94	.001	.94	.001	.95	.001	.95	.001	.95	.001
Benton County Population	.96	.001	.96	.001	.96	.001	.95	.001	.95	.001
Corvallis Population	.96	.001	.93	.001	.90	.001	.86	.001	.81	.01
Albany Population	.92	.001	.91	.001	.91	.001	.91	.001	.92	.001
Student In-migration	.99	.001	.98	.001	.97	.001	.96	.001	.94	.001
<u>Various Economic Variables for CMA</u>										
Corvallis Bank Deposits	.91	.001	.94	.001	.94	.001	.93	.001	.93	.001
Albany Bank Deposits	.91	.001	.94	.001	.96	.001	.96	.001	.96	.001
Total Bank Deposits (Corvallis and Albany)	.91	.001	.94	.001	.95	.001	.94	.001	.94	.001
Benton County Motor Vehicle Registration (Passenger)	.97	.001	.97	.001	.96	.001	.96	.001	.96	.001
Benton County Motor Vehicle Registration (Total--all)	.97	.001	.96	.001	.96	.001	.96	.001	.95	.001

^aincludes kindergarten.

r represents correlation coefficient.

p represents level of significance.

Table 10

PEARSON-PRODUCT CORRELATION COEFFICIENTS
BETWEEN SELECTED VARIABLES (TIME-LAGGED) AND DISTRICT 509J TOTAL ENROLLMENTS^a
DURING THE YEARS 1959-60 TO 1967-68

Variable	Correlation Coefficient									
	1 Year Steps		2 Year Steps		3 Year Steps		4 Year Steps		5 Year Steps	
	r	p	r	p	r	p	r	p	r	p
<u>Oregon State University Student Enrollment</u>										
Fall:										
Undergraduate	-.56	.10	-.37	-.b	-.09	-.b	.94	.001	.95	.001
Graduate	.96	.001	.95	.001	.96	.001	.96	.001	.94	.001
Total	.95	.001	.92	.001	.93	.001	.95	.001	.95	.001
Winter: Total	.95	.001	.92	.001	.93	.001	.95	.001	.96	.001
Spring:										
Undergraduate	.95	.001	.92	.001	.92	.001	.95	.001	.96	.001
Graduate	.97	.001	.97	.001	.97	.001	.96	.001	.94	.001
Total	.96	.001	.93	.001	.94	.001	.96	.001	.96	.001
<u>Oregon State University--Other Variables</u>										
Grant Expenditures	.94	.001	.92	.001	.89	.001	.84	.01	.84	.01
Wage Expenditures	.93	.001	.92	.001	.93	.001	.93	.001	.93	.001
Graduate Assistants and Fellows (FTE)	.96	.001	.97	.001	.99	.001	.98	.001	.96	.001
FTE of Academic Instructional Staff										
Professors	.92	.001	.93	.001	.94	.001	.96	.001	.95	.001
Associate Professors	.96	.001	.95	.001	.95	.001	.92	.001	.90	.001
Assistant Professors	.82	.01	.78	.01	.72	.02	.73	.02	.81	.01
Instructors	-.93	.001	-.81	.01	-.57	.10	-.22	-.b	.30	-.b
Instructional Staff (Total)	.93	.001	.93	.001	.93	.001	.94	.001	.96	.001

^aIncludes kindergarten.^bNot significant.

r represents correlation coefficient.

p represents level of significance.

Table 10 (Cont.)

PEARSON-PRODUCT CORRELATION COEFFICIENTS
BETWEEN SELECTED VARIABLES (TIME-LAGGED) AND DISTRICT 509J TOTAL ENROLLMENTS^a
DURING THE YEARS 1959-60 TO 1967-68

Variable	Correlation Coefficient									
	1 Year Steps	2 Year Steps	3 Year Steps	4 Year Steps	5 Year Steps					
<u>General Demographic Variables</u>										
Oregon Population (Estimates) Federal	.97	.001	.97	.001	.95	.001	.94	.001	.96	.001
Oregon Population (Estimates) State	.96	.001	.95	.001	.92	.001	.89	.001	.94	.001
Benton County Population	.98	.001	.97	.001	.95	.001	.94	.001	.94	.001
Corvallis Population	.98	.001	.98	.001	.97	.001	.95	.001	.95	.001
Albany Population	.86	.01	.83	.01	.82	.01	.81	.01	.79	.02
Student In-migration	.99	.001	.99	.001	.98	.001	.99	.001	.98	.001
<u>Various Economic Variables for CMA</u>										
Corvallis Bank Deposits	.90	.001	.94	.001	.94	.001	.92	.001	.90	.001
Albany Bank Deposits	.88	.001	.90	.001	.97	.001	.94	.001	.92	.001
Total Bank Deposits (Corvallis and Albany)	.89	.001	.93	.001	.95	.001	.94	.001	.91	.001
Benton County Motor Vehicle Registration (Passenger)	.97	.001	.97	.001	.97	.001	.96	.001	.95	.001
Benton County Motor Vehicle Registration (Total--all)	.93	.001	.97	.001	.96	.001	.95	.001	.95	.001

^aIncludes kindergarten.

r represents correlation coefficient.

p represents level of significance.

Note the relatively high coefficients which indicate the nature of the relationships between the independent and dependent variable. This type of correlation coefficients suggests the possibility that a strong relationship exists between the variables. Certain problems concerning the correlation coefficients became apparent and need to be explained at this point.

In essence, the number of high Pearson-Product correlation coefficients presented several major problems. One key problem revealed by the data was the possibility that these variables are highly interrelated and this would reasonably explain the high correlation coefficients which were obtained. In this case, the high correlations apparently indicate that almost all variables are related to student enrollments in some fashion.

Another crucial problem is the possibility that the high correlations resulted from a general environmental condition--growth. For example, all the variables selected represent rather steady growth patterns and this tends to camouflage which variables may "cause" an increase in school enrollments. Evidence of this growth pattern is demonstrated as one examines the actual figures for the variables utilized. This point is clearly presented in Chapter II in which the economic and population growth for the Corvallis Metropolitan Area shows a steady growth pattern. For further evidence of an underlying growth pattern of the selected variables see Appendix B for actual figures.

Thus, the research team arrived at the following conclusions which indicated that to pursue the development of an enrollment projection technique utilizing a multiple regression equation technique would not prove fruitful.

1. Insufficient data. One of the first conclusions reached by the research team was that for certain variables (i.e., building permits, power

company connects and disconnects, etc.) adequate data could not be obtained. Figures concerning these variables were not available for several reasons, (e.g., data had not been collected in a systematic manner over consecutive years and/or data had been collected but the figures applied to a different area than represented by District 509J.)

2. Inadequate measures. For the purpose of a multiple regression approach to population study within the Corvallis district, the measures obtainable tend to be distributed in such a manner as to lose their usefulness as pupil population predictors.
3. Growth pattern of variables. Generally all the variables are represented by increases in values. This leads to unanswered questions which revolve around the basic question--what causes what; i.e., do enrollments increase because of increased bank accounts or do increased bank accounts in some way reflect the increase in the number of students enrolled?

On the basis of the conclusions presented above, it was decided to focus on the alternative plan discussed earlier in Phase Four (see page 56) of the research design section. In essence, this alternative approach proposed to construct an enrollment projection model based on two key variables--Benton County birth figures and past enrollment data for District 509J.

A justification for choosing these two variables and an explanation of the techniques involved in utilizing them in the proposed projection model for District 509J is presented in the next section.

Enrollment Projection Model

The model as defined for District 509J includes five major elements:

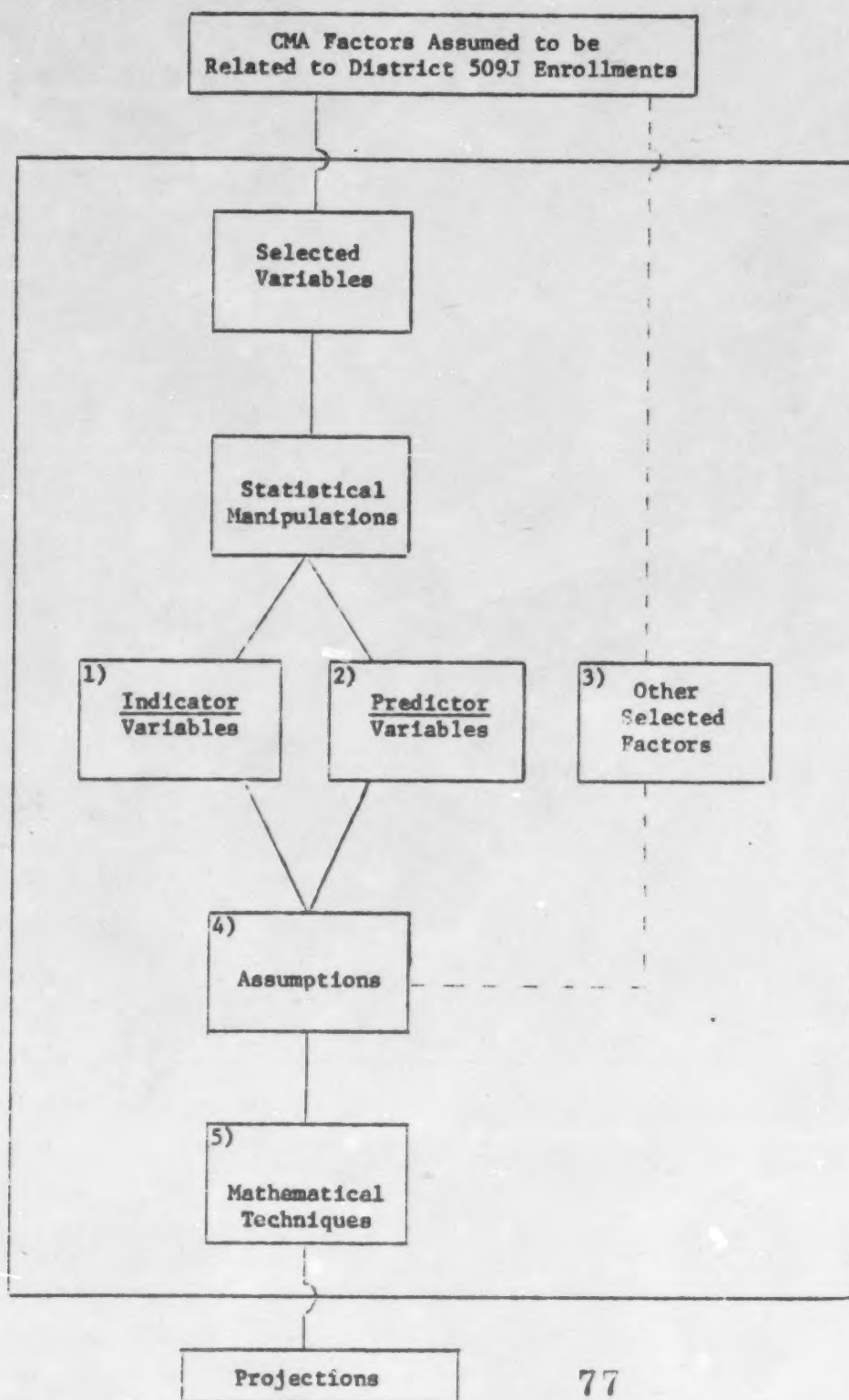
1) analysis of indicator variables; 2) analysis of predictor variables; 3) analysis of other selected factors; 4) formulation of assumptions; and 5) mathematical techniques for calculating future estimates. Figure XV is a schematic diagram illustrating input to the model, the elements of the model, and the output.

The separation of variables into two distinct classifications (indicator versus predictor) signifies that these two types of variables perform different functions within the projection model. For instance, indicator variables provide information concerning trends in specific variables which are assumed to influence District 509J total student enrollments. This type of information is used to formulate assumptions concerning the growth or decline in student enrollments. However, these indicator variables are not utilized mathematically in the projection model to calculate future estimates. Rather, this type of data provides some indication of the economic, population, or other significant trends of a particular community that relate to school enrollments.

Predictor variables assume a different function within the proposed enrollment projection model than indicator variables. The purpose of predictor variables is to provide a systematic basis for mathematically calculating estimates of future enrollments. The two variables, Benton County births and past enrollment figures, were utilized in the projection model as predictor variables because of certain assumptions which could be formulated to link these variables to possible future enrollments for District 509J.

Figure XV

SCHEMATIC DIAGRAM OF STUDY
CORVALLIS SCHOOL DISTRICT 509J

InputModelOutput

In addition, there is a small number of "other selected factors" which are considered to influence school enrollments in some fashion. These factors are utilized in the model to modify the assumptions derived from the indicator and predictor variables. As is the case for indicator variables, they are not used mathematically in the projection model to calculate future estimates.¹⁵

Each of the five elements of the proposed enrollment projection model for District 509J will be defined in the next section as follows.

1. Analysis of Indicator Variables

An indicator variable is defined as an independent variable (OSU, demographic, population and other factors) which shows a positive correlational relationship to the dependent variable (total K-12 student enrollment of District 509J) over several spans of time. The purpose for identifying indicators is to pinpoint variables which appear to fluctuate in a similar fashion corresponding to trends in total student enrollments. In other words, by determining possible indicators of student enrollments in a school district, one may provide the basis for estimating the future variation in school enrollments. However, the nature of the relationship between the indicator variables and school enrollment does not specify the direction of causality. Therefore, while these indicators provide data which reflect trends in population, economic growth, and other factors they are not used in the mathematical computations required in the enrollment projection model.

Indicators of District 509J future student enrollments were determined from an analysis of the correlation coefficients presented earlier. Those indicators

¹⁵ Taken together--indicator and predictor variables plus other selected factors--it is not suggested that these elements in total represent an exhaustive list. It must be assumed as one looks at the schematic diagram of the projection model that there are factors not examined at all as well as those not even identified.

were selected which showed a correlation significant at the .01 or .05 level in each of the four time periods analyzed (see Table 11). The variables listed below in the open table would appear to be likely indicators for future trends in those types of factors (population, economy, etc.) which may influence school enrollments in District 509J.

<u>Variable</u>		<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>
<u>Oregon State University Enrollment</u>						
Fall:	Graduate	1,353	1,529	1,727	1,877	1,960
	Total	10,533	11,906	12,668	13,358	14,524
Winter:	Total	10,158	11,397	11,957	12,825	13,917
	Undergraduate	8,278	9,192	9,608	10,335	11,266
Spring:	Graduate	1,417	1,530	1,735	1,887	1,974
	Total	9,695	10,722	11,343	12,222	13,240
<u>Oregon State University (FTE)</u>						
	Graduate Assistants and Fellows	60	66	75	77	76
	Associate Professors	169	163	194	201	216
<u>General Demographic Variables</u>						
	Corvallis Population	27,383	28,400	29,500	29,500	31,350
	Albany Population	15,088	15,700	16,500	17,000	17,700
<u>Various Economic Variables for CFA</u>						
	Benton County Motor Vehicle Registration (Total--all)	23,033	24,486	25,548	26,503	27,482
<u>School Enrollment</u>		<u>1964-65</u>	<u>1965-66</u>	<u>1966-67</u>	<u>1967-68</u>	<u>1968-69</u>
	District 509J Enrollment ^a	7,411	7,769	8,072	8,110	8,416

^aIncludes kindergarten and unclassified students

On the basis of an analysis by inspection of the specified indicator variables, it was concluded that the most prevalent pattern appears to be one of moderate growth for the immediate future. This point was earlier alluded to in Chapters II and III of the report.

Table 11

CORRELATION COEFFICIENT AND LEVEL OF SIGNIFICANCE
OF INDICATOR VARIABLES FOR SEVERAL SPANS OF TIME
IN DISTRICT 509J

Indicator Variables	Correlation Coefficient					
	24 Years (1945-68)	10 Years (1959-68)	5 Years (1960-65)	5 Years (1965-69)	r	p
<u>Oregon State University Student Enrollment</u>						
Fall: Graduate	.93 .001	.97 .001	.97 .01	.98 .01		
Total	.88 .001	.97 .001	.96 .02	.99 .01		
Winter: Total	.83 .001	.97 .001	.96 .02	.98 .01		
Undergraduate	.87 .001	.97 .001	.98 .01	.97 .01		
Spring: Graduate	.94 .001	.98 .001	.99 .001	.97 .01		
Total	.89 .001	.97 .001	.98 .01	.97 .01		
<u>Oregon State University--Other Variables</u>						
FTE of Academic Instructional Staff						
Graduate Assistants and Fellows	.95 .001	.97 .001	.99 .001	.93 .05		
Associate Professors	.96 .001	.95 .001	.99 .01	.90 .05		
<u>General Demographic Variables</u>						
Corvallis Population	.97 .001	.98 .001	.98 .01	.88 .05		
Albany Population	.92 .001	.97 .001	.95 .02	.96 .05		
<u>Various Economic Variables for OMA</u>						
Benton County Motor Vehicle Registration (Total--all)	.97 .001	.98 .001	.95 .02	.96 .05		

r represents correlation coefficient.

p represents level of significance.

2. Analysis of Predictor Variables

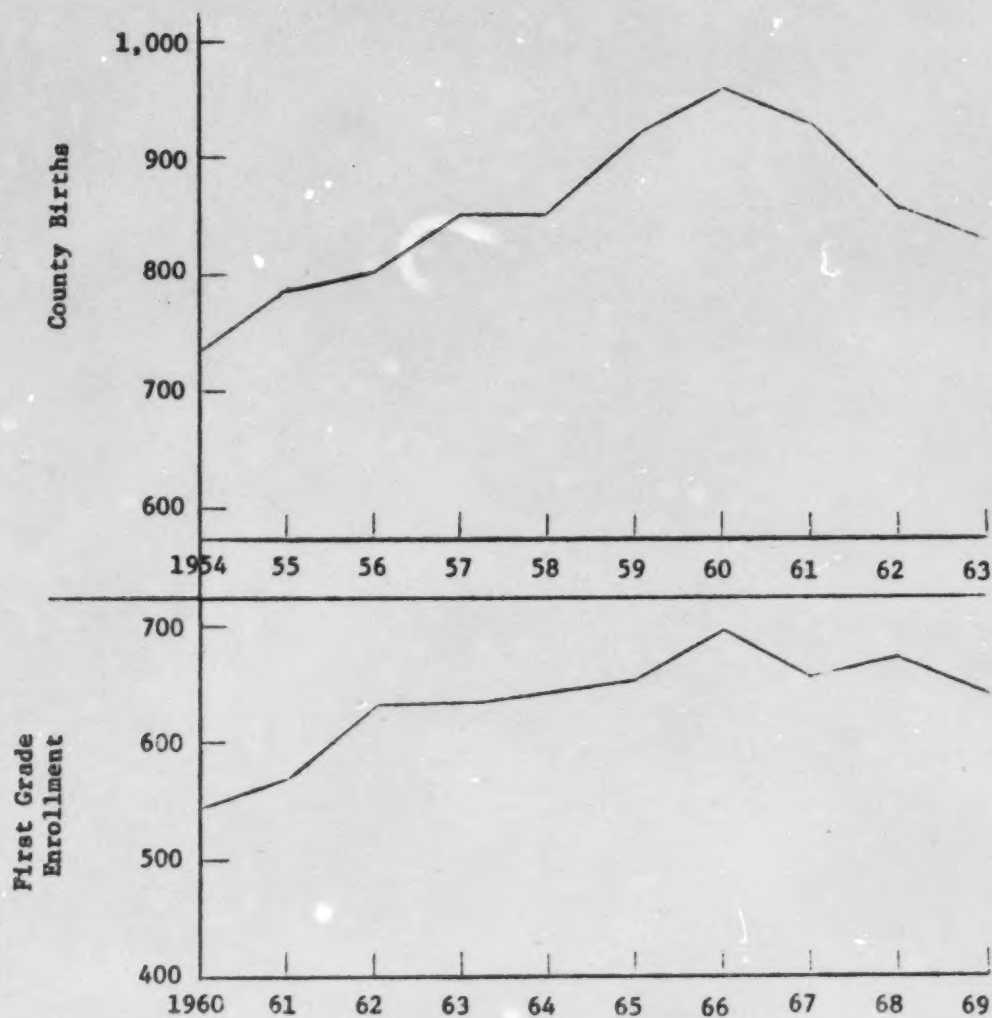
A predictor variable is defined as an independent variable which, because of its relationship to District 509J school enrollments, is utilized mathematically in the enrollment projection model to estimate future enrollments. The sufficient characteristics for a predictor depend upon two considerations. First, a direction of causality needs to be established to support the contention that an increase or decrease in the predictor influences the dependent variable (District 509J total enrollments) in a corresponding manner. Secondly, in measuring the nature of this relationship the predictor needs to show a positive correlation at a high level of significance. Furthermore, the idea of causality implies that there is a direct connection between the predictor and enrollment.

The two variables chosen by the research team as predictors were Benton County Live Births and District 509J past grade enrollments. Consequently, these two variables form the key data on which the enrollment projection model is based in determining future estimates of enrollments. In essence, Benton County birth figures were used to project future first grade enrollments and past grade enrollment data were analyzed to project the movement of students in the district now as they progress through the next five grades or five-year time period.

Benton County Live Births. The reason for examining birth figures as a possible predictor variable is that a strong logical connection can be made between the number of births and first grade enrollments six years later in a given geographical area. The reason for accepting Benton County births as a predictor variable was the correlation obtained when comparing this variable (1954-63) to past first grade enrollments six years later (1960-69). The correlation was .88 which is significant at the .001 level of significance. Figure XVI further illustrates the apparent relationship between these two variables.

Figure XVI

GRAPHIC INDICATION OF RELATIONSHIP BETWEEN BENTON COUNTY BIRTHS
AND DISTRICT 509J FIRST GRADE ENROLLMENTS



Another technique was utilized to test the reasonableness of the assumption that there is a positive relationship between Renton County births and District 509J first grade enrollments six years later. This method involved using actual past data and the proposed enrollment projection model to make estimates of future first grade enrollments over several spans of time. By comparing the projected figures with actual enrollment it was possible to determine a range of percentage error. The time periods analyzed and the range of percentage error of the estimates using the proposed projection model were as follows:

<u>Time Period</u>	<u>Actual First Grade Observations</u>	<u>Range of Percentage Error</u>
1965-69	5	±5.0%
1966-70	4	±5.0%
1967-71	3	±5.0%
1968-72	2	±5.0%
1969-73	1	±5.0%

Progression Ratios. Progression ratios¹⁶ were computed utilizing past enrollment data by grades for District 509J over the school years 1949-50 through 1968-69. Then by grouping these ratios by grades in five-year periods in different ways three distinct ratios were obtained--high, mean, and low. The mean ratios for each grade progression (1-2, 2-3, . . . 11-12) were determined by averaging all respective grade ratios for any particular five-year period, while the high and low ratios were calculated by selecting the average ratio of the three high or three low ratios for each grade.

¹⁶ See Chapter III for further explanation.

$$\text{Progression Ratio by Grade} = \frac{\text{Enrollment in grade X in a given year}}{\text{Enrollment in grade (X-1) the previous year}}$$

These computed ratios then became a basis in the enrollment projection model of providing a means of forecasting the movement of students through grades 1-12 in District 509J. For example, by using the ratios computed between years 1956 and 1957, 1957 and 1958, 1958 and 1959, 1959 and 1960, and 1960 and 1961, a mean ratio per grade was obtained which was used to project the progression of students through grades 1-12 over the next five-year period, 1962-1966.

This technique utilizing progression ratios for each grade is designed to project the progression of students grade by grade through a school system. To test the assumption that this method was applicable in terms of providing accurate estimates of the movement by grade of students through District 509J several analyses were conducted.

First, high, mean, and low grade ratios based on past data were used to forecast enrollments by five-year periods for 1956-60, 1961-65, and 1966-70. Then the projected figures were compared to the actual Corvallis school enrollments over these same spans of time to determine which of the three progression ratios (high, mean, low) provided more accurate estimates of student enrollments. This analysis indicated that the mean projection ratio for individual grades consistently provided a reliable estimate in terms of total actual enrollments.

Secondly, the research team developed a different technique for determining the actual progression ratio for each grade in the proposed enrollment projection model. Basically, this involved using the span of time 1955-1969 on which to calculate progression ratios for 1970-1974 rather than only the last five years, 1965-1969. The rationale behind this decision was to increase the number of observations of progression ratios for individual grades. This was accomplished by computing mean ratios for five-year periods by overlapping one year

at a time from 1955-1969. The following open table is designed to illustrate the number of ratios calculated:

<u>Years for which Progression Ratios Were Calculated (by grades, 1-2, 2-3, . . . 11-12)</u>	<u>Years for which Mean Progression Ratios Were Calculated</u>
1955-56, 1956-57, 1957-58, 1958-59, 1959-60	1961, 1962, 1963, 1964, 1965
1956-57, 1957-58, 1958-59, 1959-60, 1960-61	1962, 1963, 1964, 1965, 1966
1957-58, 1958-59, 1959-60, 1960-61, 1961-62	1963, 1964, 1965, 1966, 1967
1958-59, 1959-60, 1960-61, 1961-62, 1962-63	1964, 1965, 1966, 1967, 1968
1959-60, 1960-61, 1961-62, 1962-63, 1963-64	1965, 1966, 1967, 1968, 1969
1960-61, 1961-62, 1962-63, 1963-64, 1964-65	1966, 1967, 1968, 1969, 1970
1961-62, 1962-63, 1963-64, 1964-65, 1965-66	1967, 1968, 1969, 1970, 1971
1962-63, 1963-64, 1964-65, 1965-66, 1966-67	1968, 1969, 1970, 1971, 1972
1963-64, 1964-65, 1965-66, 1966-67, 1967-68	1969, 1970, 1971, 1972, 1973
1964-65, 1965-66, 1966-67, 1967-68, 1968-69	1970, 1971, 1972, 1973, 1974

An analysis of projected enrollments compared to actual enrollments for the years 1961-1969 tended to show that the mean progression ratio for individual grades provided the most accurate projections.

Thirdly, the mean progression ratios (for each grade) representing five-year periods were arranged in such a manner that a number of overlapping five-year mean ratios were derived. Essentially, the proposed enrollment projection technique uses these overlapping five-year mean ratios to estimate the movement of students by grade through District 509J for future years. The detailed calculations are difficult to explain; therefore, Table 12 graphically describes the technique used to determine the grade progression ratios for the enrollment projection model to provide estimates for the years, 1970-74. Note that the

Table 12

TECHNIQUE FOR DETERMINING GRADE PROGRESSION RATIOS
FOR PROPOSED ENROLLMENT PROJECTION MODEL

Progression Ratios by Grades for Years	Mean Ratio from Varying Number of Overlapping Five-Year Periods	Grade Progression Ratios for Years				
		1970-71	1971-72	1972-73	1973-74	1974-75
1964-65, 1965-66, 1966-67, 1967-68, 1968-69		.	.	.	.	.
1963-64, 1964-65, 1965-66, 1966-67, 1967-68		.	.	.	.	.
1962-63, 1963-64, 1964-65, 1965-66, 1966-67		.	.	.	.	.
1961-62, 1962-63, 1963-64, 1964-65, 1965-66		.	.	.	.	.
1960-61, 1961-62, 1962-63, 1963-64, 1964-65		.	.	.	.	.
	Mean Five Overlapping Five-Year Ratio →					
1964-65, 1965-66, 1966-67, 1967-68, 1968-69		.	.	.	.	.
1963-64, 1964-65, 1965-66, 1966-67, 1967-68		.	.	.	.	.
1962-63, 1963-64, 1964-65, 1965-66, 1966-67		.	.	.	.	.
1961-62, 1962-63, 1963-64, 1964-65, 1965-66		.	.	.	.	.
	Mean Four Overlapping Five-Year Ratio →					
1964-65, 1965-66, 1966-67, 1967-68, 1968-69		.	.	.	.	.
1963-64, 1964-65, 1965-66, 1966-67, 1967-68		.	.	.	.	.
1962-63, 1963-64, 1964-65, 1965-66, 1966-67		.	.	.	.	.
	Mean Three Overlapping Five-Year Ratio →					
1964-65, 1965-66, 1966-67, 1967-68, 1968-69		.	.	.	.	.
1963-64, 1964-65, 1965-66, 1966-67, 1967-68		.	.	.	.	.
	Mean Two Overlapping Five-Year Ratio →					
1964-65, 1965-66, 1966-67, 1967-68, 1968-69		.	.	.	.	.
	Mean One Overlapping Five-Year Ratio →					

projected first-year mean progression ratio includes five overlapping years, and that in each succeeding year the oldest past enrollment data for a five-year period are discarded.

This technique was tested for its applicability to District 509J by using past enrollment data to make projections. For example, the research team used past data (1955-64) to forecast enrollments for the periods 1965-69, 1966-70, 1967-71, 1968-72 and 1969-73. By comparing projected total enrollments with actual enrollments for the years 1965, 1966, 1967, 1968, and 1969 the applicability of this technique to District 509J was examined. Results of this type of analysis indicated that the midpoint between the overlapping five-year mean and low progression ratios provided the closest estimates of total student enrollments. Table 13 shows projected figures (midpoint of mean and low projection), actual enrollments, number of projected students above (+) or below (-) actual enrollments and the percentage above (+) or below (-) of the projected figures compared to actual total enrollments.

On the basis of the discussed techniques to develop and analyze the proposed enrollment projection method, the research team concluded that this method appears to provide suitable estimates of future enrollments based on past experience. Furthermore, by testing this model on past enrollment data it was possible to derive guidelines as to the possible percentage error that may occur in projecting enrollments five years in the future. Analysis of the accuracy of this technique suggests that the following percentages may serve as guidelines for the likely range of errors in estimation.

<u>Projected Years</u>				
First	Second	Third	Fourth	Fifth
±1%	±2%	±3%	±4%	±5%

Table 13

COMPARISON OF PROJECTED AND ACTUAL TOTAL ENROLLMENTS
FOR DISTRICT 509J, 1965-66 TO 1968-69^a

	1965	1966	1967	1968	1969
	7068	7379	7667	7866	7981
	(+29) (+0.41%)	(-1) (-0.01%)	(+240) (+3.23%)	(+173) (+2.25%)	(+527) (+7.07%)
	7322	7524	7737	7824	
	(-58) (-0.78%)	(+97) (+1.31%)	(+44) (+0.57%)	(+370) (4.96%)	
		7575	7688	7727	
		(+148) (+1.99%)	(-5) (-0.06%)	(+273) (+3.66%)	
			7532	7579	
			(-161) (-2.09%)	(+125) (+1.68%)	
				7731	
				(+277) (+3.72%)	
Actual Enrollments	7039	7380	7427	7693	7454

^aTotal enrollments include grades 1-12 only.

3. Analysis of Other Selected Factors

Other selected factors are defined as those factors which were not analyzed in the manner that resulted in the identification of either indicator or predictor variables. Factors such as the closing of Adair Air Force Station, legislative action limiting enrollment at Oregon State University, and the conclusion drawn by the research team of a community commitment, at this point in time, to highly selective industrial growth, limited generally to what is referred to as "clean" industry in the CMA.

4. Formulation of Assumptions

The enrollment estimates made by the research team assume that the predictor variables will continue to operate and vary in about the same degree and manner as was found in the period analyzed, upon which experience the estimates are based. However, the estimates are modified based on assumptions concerning indicators and other selected factors.

- a. The geographic area of the Corvallis School District will remain constant.

(It appears unlikely that any substantial change will occur in the boundary lines of the Corvallis School District.)

- b. The instructional program will continue to provide for students in grades K-12 only.

(Pressures for pre-school education may arise in future years.)

- c. The parochial schools located within the Corvallis district will continue providing instruction in grades 1-8 without significant change in present enrollments.

(The parochial schools contemplate no major changes in the near future.)

The research team does not view this point as critical, however, because of the small number of children involved.)

- d. The progression ratios from grade to grade will remain relatively unchanged and the holding power of the schools will continue at present levels.

(These ratios, based on the average of varying numbers of overlapping five-year periods, may reasonably be expected to hold over the next few years.)

- e. In-migration resulting from economic growth will introduce sufficient numbers of young children to offset a declining birth rate and produce a stabilized period in total enrollments.

(The potential for economic growth appears good and some increases in enrollment based on in-migration seem reasonable. This point in large measure appears to depend on past and future actions of the state legislature with relation to enrollment ceiling at OSU as well as the development of new university-related industry, public and/or private. Selective industrial growth is within the planning powers of officials of the CMA. The closing of Adair Air Force Station will produce an out-migration which clearly dampens increases in student enrollments due to in-migration.)

- f. The relationship between Benton County births and the number of District 509J first grade students six years later will continue to be constant over the projected five-year span of time.

(The enrollment projection model technique for projecting first grade enrollments is based on this assumption, and it appears reasonable to expect this relationship to hold over the next few years.)

5. Mathematical Techniques for Calculating Future Estimates

The proposed enrollment projection model is based upon specific assumptions which are assumed to be valid for the projected span of time. Furthermore, the mathematical techniques used to determine the projections were developed using the two predictor variables--Benton County births and District 509J past enrollment data. The actual computations were performed by an IBM Model #360 computer located on the campus at the University of Oregon in Eugene. A brief sketch (a and b) describing the techniques for utilizing the two predictor variables in the enrollment projection model to arrive at projected figures for 1970-74 is presented in the two open tables as follows.

a. Computation for Estimating Enrollments (Grade 1). The first grade estimates for District 509J were determined by using past Benton County births and first grade enrollments in the following manner:

Year	First Grade Enrollments	County Births 6 Years Prior	Year	Ratio Enrollment to County Births
1964	642	853	1958	.7526
1965	653	919	1959	.7106
1966	698	961	1960	.7263
1967	661	928	1961	.7123
1968	675	860	1962	.7849
1969	642	827	1963	.7763

Total of selected ratios is 4.4630

The average of the selected ratios is .7438

<u>Year</u>	<u>County Births</u>				<u>First Grade Estimates</u>	<u>Year</u>
1964	727	x	.7438	-	541	1970
1965	785	x	.7438	-	584	1971
1966	752	x	.7438	-	559	1972
1967	803	x	.7438	-	597	1973
1968	805	x	.7438	-	599	1974

These first grade figures were inserted in the program to provide estimates for the next five years. As explained earlier, an application of this technique to past data indicated a general percentage range of error of $\pm 5\%$. Therefore, the final first grade estimates were determined by applying this $\pm 5\%$ error to the projected first grade figures calculated above and this resulted in the range of first grade enrollments presented in Chapter V.

b. Computation for Estimating Enrollments (Grades 2-12). The estimates for grades 2-12 for District 509J were computed on the IBM #360 computer by applying progression ratios to the 1969-70 past grade enrollments. The technique for calculating the mean overlapping five-year progression ratios has been presented earlier in this chapter (see pages 75-79). Table 14 illustrates the general method for applying these progression ratios to arrive at grade estimates for District 509J for the years 1970-74. The final estimates presented in Chapter V represent the midpoint of the mean and low projected figures computed for District 509J (see pages 89-94).

Table 14

METHOD FOR APPLYING GRADE PROGRESSION RATIOS TO DETERMINE
DISTRICT 509J ENROLLMENT ESTIMATES, 1970-71 to 1974-75

Grade	1970			1971			1972			1973			1974		
	Enrollment	Progression Ratio	Grade	Projected Enrollment	Progression Ratio	Grade	Projected Enrollment	Progression Ratio	Grade	Projected Enrollment	Progression Ratio	Grade	Projected Enrollment	Progression Ratio	Grade
1	642 x PR ^b (1-2)		1 First Grade ^a x PR ^b (1-2) =	2		2	1 First Grade ^a x PR ^b (1-2) =	2		2		2	1 First Grade ^a		2
2	647 x PR(2-3)		2	2		3	2		3		3		3		3
3	642 x PR(3-4)		3	3		4	3		4		4		4		4
4	640 x PR(4-5)		4	4		5	4		5		5		5		5
5	610 x PR(5-6)		5	5		6	5		6		6		6		6
6	592 x PR(6-7)		6	6		7	6		7		7		7		7
7	578 x PR(7-8)		7	7		8	7		8		8		8		8
8	627 x PR(8-9)		8	8		9	8		9		9		9		9
9	646 x PR(9-10)		9	9		10	9		10		10		10		10
10	595 x PR(10-11)		10	10		11	10		11		11		11		11
11	650 x PR(11-12)		11	11		12	11		12		12		12		12
12	585		12	12											

^a Estimate from county birth technique

^b Progression ratio for grades--these progression ratios change for each projected year: 1970, 1971, 1972, 1973, 1974.

Chapter V presents the projections for the years 1970-74 for District 509J resulting from the application of this proposed enrollment projection model to past enrollment data from 1960-1969.

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CHAPTER V
ANALYSIS OF ENROLLMENT PROJECTIONS
FOR DISTRICT 509J, 1970-74

Introduction

The estimates of student enrollments are based on the assumptions formulated and presented in Chapter IV. It should be noted that the accuracy of these figures depends upon how valid these assumptions remain for District 509J during the projected time span. Numbers are not listed for unclassified and kindergarten students because this report was concerned primarily with developing estimates of students for grades 1-12. Estimates of enrollments for these two categories will be derived in conjunction with school officials from District 509J to provide estimates for future planning.

Table 15 lists the past enrollments by grade for District 509J for the school years 1965-66 to 1969-70. The figures in parentheses show the increase (+) or decrease (-) in number of students and percentage change for the year 1969-70 when compared to the base year 1965-66. For example, the figures indicate that enrollment at all three levels (1-6, 7-9, 10-12) increased during this immediate past five-year span of time. The elementary level (1-6) increased by 137 students or 3.76 percent, the junior high level (7-9) increased by 62 students or 3.34 percent, and the senior high level (10-12) increased by 216 students or 11.80 percent. The total enrollment increased by 415 students or 5.89 percent. However, note that enrollments in the school year 1969-70 show a substantial decrease when compared to the year 1968-69. This variation

Table 15

PAST ENROLLMENT BY GRADES FOR CORVALLIS SCHOOL DISTRICT 509J
1965-66 TO 1969-70

Grades	1965-66	1966-67	1967-68	1968-69	1969-70	Increase or Decrease from Base Year 1965-66	
						Number	Percentage
1	653	698	661	675	642		
2	613	640	684	671	647		
3	580	634	635	669	642		
4	642	564	634	659	640		
5	608	639	565	610	610		
6	<u>540</u>	<u>602</u>	<u>629</u>	<u>599</u>	<u>592</u>		
Total 1-6	<u>3,636</u>	<u>3,777</u>	<u>3,808</u>	<u>3,883</u>	<u>3,773</u>	<u>(+137)</u>	<u>(+3.76%)</u>
7	609	580	604	649	578		
8	580	625	581	637	627		
9	<u>600</u>	<u>639</u>	<u>653</u>	<u>622</u>	<u>646</u>		
Total 7-9	<u>1,789</u>	<u>1,844</u>	<u>1,838</u>	<u>1,908</u>	<u>1,851</u>	<u>(+62)</u>	<u>(+3.34%)</u>
10	558	626	631	677	595		
11	535	579	587	645	650		
12	<u>521</u>	<u>554</u>	<u>563</u>	<u>580</u>	<u>585</u>		
Total 10-12	<u>1,614</u>	<u>1,759</u>	<u>1,781</u>	<u>1,902</u>	<u>1,830</u>	<u>(+216)</u>	<u>(+11.80%)</u>
Total 1-12	<u>7,039</u>	<u>7,380</u>	<u>7,427</u>	<u>7,693</u>	<u>7,454</u>	<u>(+415)</u>	<u>(+5.89%)</u>
Unclassified	16	16	18	34	80		
Kindergarten	714	676	660	689	573		
Total (Unclassified K, 1-12)	<u>7,769</u>	<u>8,072</u>	<u>8,110</u>	<u>8,416</u>	<u>8,107</u>		

suggests that the predominant trend of steady growth in enrollments for District 509J may be changing to one of stabilization depending upon the various factors influencing school enrollments.

Enrollment Projections 1970-71 to 1974-75

The final estimates of future student enrollments for District 509J are presented in Table 16. A range and probable estimate are given for each grade as well as the three levels--elementary, junior high, and senior high. Also the total enrollment (1-12) for projected years has been designated by range and estimate figures. As explained earlier, the range and percentage error figures listed were derived from past experience as to the effectiveness of the enrollment projection model to forecast enrollments for District 509J.

An analysis of the figures shown in Table 16 indicates that the elementary level (1-6) is expected to decrease by 380 students or 10.07 percent¹ during the next five-year span. However, both the junior and senior high levels are expected to increase in varying amounts, the junior high by 123 students or 6.65 percent and the senior high by 66 students or 3.61 percent. Overall, the total enrollment (1-12) is listed as decreasing by 190 students or -2.55 percent.

The purpose of providing a range for grade and level enrollments is to suggest that the actual enrollments for District 509J during the projected years will be assumed to fall somewhere between the outlined extremes. This type of forecasting technique is suggested as a guideline for estimating possible minimum and maximum projected enrollments for the years 1970 to 1974. Figure XVII illustrates the three levels--elementary, junior high, and senior high--in their relationship of immediate past five-year actual enrollment to their projected range and estimates five years hence.

¹Percentage calculated by using 1969-70 as the base year.

Table 16
STUDENT ENROLLMENT PROJECTION FOR
CORVALLIS SCHOOL DISTRICT #509J, 1970-71 to 1974-75*

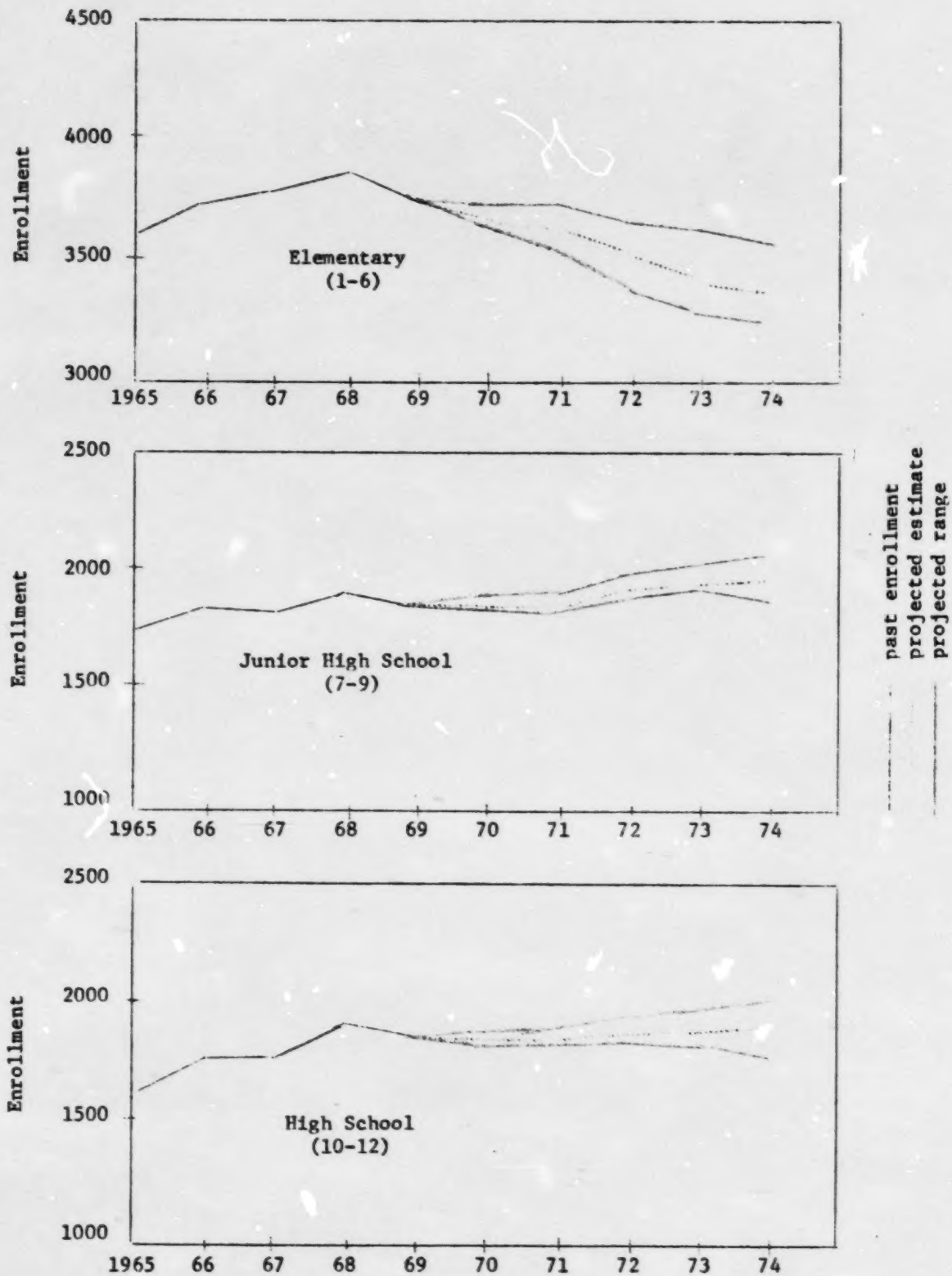
Past Enrollments	Enrollment Projections												
	1969-70	1970-71		1971-72		1972-73		1973-74		1974-75		Increase or Decrease from Base Year 1969-70	
Grades		Range	Estimate	Range	Estimate	Range	Estimate	Range	Estimate	Range	Estimate	Number	Percentage
1	642	514-568	541	555-613	584	531-587	559	567-627	597	569-629	599		
2	647	615-628	622	502-555	529	542-599	570	513-573	545	555-613	584		
3	642	627-642	635	598-623	611	499-551	525	536-592	564	512-566	539		
4	640	640-650	645	622-648	635	592-627	609	500-552	526	534-590	562		
5	610	628-638	633	626-647	637	608-644	626	574-620	597	491-542	517		
6	592	506-614	610	621-642	631	618-650	634	599-647	623	563-672	593		
Total 1-6	3,773	3630-3741	3685	3525-3728	3,626	3385-3658	3,523	3293-3611	3,452	3224-3563	3,393	(-380)	(-10.07%)
7	578	603-613	608	616-636	626	629-663	646	623-669	646	599-663	631		
8	627	583-591	587	607-625	616	618-648	633	631-676	653	622-680	651		
9	646	662-679	670	615-639	627	639-675	657	651-700	675	658-726	692		
Total 7-9	1,851	1848-1863	1,865	1838-1900	1,869	1866-1986	1,936	1905-2045	1,975	1879-2069	1,974	(+123)	(+6.65%)
10	595	634-645	640	650-680	665	603-640	622	626-678	652	635-701	668		
11	650	566-583	574	605-634	619	622-669	646	582-634	608	606-673	639		
12	585	629-643	636	548-578	563	585-627	606	599-650	629	557-622	589		
Total 10-12	1,830	1829-1871	1,850	1803-1891	1,847	1810-1936	1,873	1807-1972	1,890	1757-1996	1,896	(+66)	(+3.61%)
Total 1-12	7,454	7308-7495	7401	7166-7519	7,343	7085-7580	7,333	7005-7628	7,317	6900-7628	7,264	(-190)	(-2.55%)
Percent Error of Estimate		2%	+1%	4%	+2.0%	6%	+3.0%	8%	+4.0%	10%	+5.0%		
Unclassified													
Kindergarten	573												
Total (Unclassified K, 1-12)	8,107												

*Includes grades 1-12 only.

Figure XVII

RELATIONSHIP OF IMMEDIATE PAST FIVE-YEAR ENROLLMENT
TO PROJECTED RANGE AND ESTIMATES (Three Levels)
CORVALLIS SCHOOL DISTRICT 509J

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The research team recommends that the enrollment projection model be updated each year to determine future estimates. An analysis of projected figures to actual enrollments would provide a means for evaluating the effectiveness of this model. Furthermore, any change in factors influencing student enrollments would necessitate a modification in the assumptions upon which the technique is based. In this manner, the effectiveness of the formulated projection model could be improved and thus create more confidence in estimates of future enrollments.

APPENDIX A

Appendix A-1

PAST ENROLLMENT, 1945-1950*
CORVALLIS SCHOOL DISTRICT

Grades	1945	1946	1947	1948	1949	1950
Unclassified	0	2	0	1	0	0
K	0	0	0	0	39	179
1	148	133	170	179	225	250
2	154	134	129	168	183	235
3	147	140	139	140	169	181
4	133	136	145	139	155	174
5	123	125	128	147	150	155
6	<u>140</u>	<u>123</u>	<u>120</u>	<u>135</u>	<u>159</u>	<u>146</u>
Total K-6	<u>845</u>	<u>791</u>	<u>831</u>	<u>908</u>	<u>1,080</u>	<u>1,320</u>
7	137	151	123	139	141	168
8	162	117	152	129	151	142
9	<u>235</u>	<u>221</u>	<u>195</u>	<u>238</u>	<u>229</u>	<u>249</u>
Total 7-9	<u>534</u>	<u>489</u>	<u>470</u>	<u>506</u>	<u>521</u>	<u>559</u>
10	200	193	203	189	222	213
11	199	176	182	204	196	209
12	<u>159</u>	<u>182</u>	<u>155</u>	<u>160</u>	<u>187</u>	<u>183</u>
Total 10-12	<u>558</u>	<u>555</u>	<u>540</u>	<u>553</u>	<u>605</u>	<u>605</u>
Total 1-12	<u>1,937</u>	<u>1,837</u>	<u>1,841</u>	<u>1,968</u>	<u>2,206</u>	<u>2,484</u>
Pupil Increase (Decrease)		(-100)	4	127	238	278
Percent of Increase (Decrease)		(-5.2%)	0.2%	6.9%	12.1%	12.6%

* Enrollment as of September 30 for each year, from school district records.

Appendix A-2

PAST ENROLLMENT, 1951-1956*
CORVALLIS SCHOOL DISTRICT

Grades	1951	1952	1953	1954	1955	1956
Unclassified	0	2	0	0	0	0
K	227	309	289	215	328	383
1	229	269	328	286	409	430
2	227	216	252	322	394	408
3	199	216	218	229	389	387
4	167	204	217	214	304	376
5	169	161	192	225	283	317
6	<u>141</u>	<u>164</u>	<u>163</u>	<u>205</u>	<u>287</u>	<u>279</u>
Total K-6	<u>1,359</u>	<u>1,539</u>	<u>1,659</u>	<u>1,696</u>	<u>2,394</u>	<u>2,580</u>
7	140	140	161	168	256	302
8	187	155	154	182	246	253
9	<u>251</u>	<u>265</u>	<u>237</u>	<u>246</u>	<u>267</u>	<u>278</u>
Total 7-9	<u>578</u>	<u>560</u>	<u>552</u>	<u>596</u>	<u>769</u>	<u>833</u>
10	242	238	239	229	246	258
11	200	234	217	222	215	220
12	<u>192</u>	<u>168</u>	<u>216</u>	<u>195</u>	<u>199</u>	<u>203</u>
Total 10-12	<u>634</u>	<u>640</u>	<u>672</u>	<u>646</u>	<u>660</u>	<u>681</u>
Total 1-12	<u>2,571</u>	<u>2,741</u>	<u>2,883</u>	<u>2,938</u>	<u>3,823</u>	<u>4,094</u>
Pupil Increase	87	170	142	55	885	271
Percent of Increase	3.4%	6.6%	5.2%	1.9%	30.1%	7.1%

* Enrollment as of September 30 for each year, from school district records.

Appendix A-3

PAST ENROLLMENT, 1957-1962*
CORVALLIS SCHOOL DISTRICT

Grades	1957	1958	1959	1960	1961	1962
Unclassified	0	0	12	9	9	10
K	434	509	526	583	617	608
1	439	502	541	543	570	631
2	441	444	509	551	544	559
3	422	456	460	537	567	512
4	401	442	491	483	546	575
5	406	410	474	495	488	536
6	<u>323</u>	<u>416</u>	<u>445</u>	<u>483</u>	<u>508</u>	<u>501</u>
Total K-6	<u>2,866</u>	<u>3,179</u>	<u>3,446</u>	<u>3,676</u>	<u>3,840</u>	<u>3,922</u>
7	304	347	469	487	506	514
8	333	288	375	473	518	519
9	<u>310</u>	<u>353</u>	<u>342</u>	<u>425</u>	<u>528</u>	<u>554</u>
Total 7-9	<u>947</u>	<u>988</u>	<u>1,186</u>	<u>1,385</u>	<u>1,552</u>	<u>1,587</u>
10	265	295	351	341	415	525
11	226	256	287	370	345	395
12	<u>208</u>	<u>233</u>	<u>265</u>	<u>283</u>	<u>359</u>	<u>334</u>
Total 10-12	<u>699</u>	<u>784</u>	<u>903</u>	<u>994</u>	<u>1,119</u>	<u>1,254</u>
Total 1-12	<u>4,512</u>	<u>4,951</u>	<u>5,547</u>	<u>6,064</u>	<u>6,520</u>	<u>6,773</u>
Pupil Increase	418	449	596	517	456	253
Percent of Increase	10.2%	9.9%	12.0%	9.3%	7.5%	3.9%

* Enrollment as of September 30 for each year, from school district records.

Appendix A-4

PAST ENROLLMENT, 1963-1969*
CORVALLIS SCHOOL DISTRICT

Grades	1963	1964	1965	1966	1967	1968	1969
Unclassified	12	4	16	16	18	34	80
K	645	659	714	676	660	689	573
1	632	642	653	698	661	675	642
2	656	592	613	640	684	671	647
3	579	633	580	634	635	669	642
4	546	590	642	564	634	659	640
5	587	534	608	639	565	610	610
6	<u>550</u>	<u>581</u>	<u>540</u>	<u>602</u>	<u>629</u>	<u>599</u>	<u>592</u>
Total K-6	<u>4,195</u>	<u>4,231</u>	<u>4,350</u>	<u>4,453</u>	<u>4,468</u>	<u>4,572</u>	<u>4,346</u>
7	530	560	609	580	604	649	578
8	531	526	580	625	581	637	627
9	<u>542</u>	<u>568</u>	<u>600</u>	<u>639</u>	<u>653</u>	<u>622</u>	<u>646</u>
Total 7-9	<u>1,603</u>	<u>1,654</u>	<u>1,789</u>	<u>1,844</u>	<u>1,838</u>	<u>1,908</u>	<u>1,851</u>
10	553	532	558	626	631	677	595
11	491	522	535	579	587	645	650
12	<u>407</u>	<u>468</u>	<u>521</u>	<u>554</u>	<u>563</u>	<u>580</u>	<u>585</u>
Total 10-12	<u>1,451</u>	<u>1,522</u>	<u>1,614</u>	<u>1,759</u>	<u>1,881</u>	<u>1,902</u>	<u>1,830</u>
Total 1-12	<u>7,261</u>	<u>7,411</u>	<u>7,769</u>	<u>8,072</u>	<u>8,110</u>	<u>8,416</u>	<u>8,107</u>
<u>Per Year</u>							
Pupil Increase	488	150	358	303	38	306	-309
Percent of Increase	7.2%	2.1%	4.8%	3.9%	0.5%	3.8%	-3.7%

* Enrollment as of September 30 for each year, from school district records.

APPENDIX B

Appendix B-1

OREGON STATE UNIVERSITY STUDENT ENROLLMENT
1947-48 THROUGH 1968-69
FALL TERM^a

Year	Under- Graduate	Graduate	Total
1947-48	7,165	324	7,489
1948-49	7,066	362	7,428
1949-50	6,372	421	6,793
1950-51	5,382	505	5,887
1951-52	4,570	432	5,002
1952-53	4,499	413	4,912
1953-54	4,451	417	4,868
1954-55	4,815	426	5,241
1955-56	5,710	450	6,160
1956-57	6,338	453	6,791
1957-58	7,073	603	7,676
1958-59	7,302	679	7,981
1959-60	6,971	758	7,729
1960-61	7,074	825	7,899
1961-62	8,106	933	9,039
1962-63	8,953	1,084	10,037
1963-64	9,189	1,238	10,427
1964-65	9,180	1,353	10,533
1965-66	10,377	1,529	11,906
1966-67	10,941	1,727	12,668
1967-68	11,481	1,877	13,358
1968-69 (est.)	12,564	1,960	14,524

^aSources: Chancellor's Office, Oregon State System of Higher Education, Eugene and Office of Dean of Administration, Oregon State University, Corvallis.

Appendix B-2

OREGON STATE UNIVERSITY STUDENT ENROLLMENT
1947-48 THROUGH 1968-69
WINTER TERM^a

Year	Total
1947-48	7,089
1948-49	7,118
1949-50	6,549
1950-51	5,408
1951-52	4,706
1952-53	4,668
1953-54	4,614
1954-55	5,126
1955-56	5,956
1956-57	6,628
1957-58	7,490
1958-59	7,577
1959-60	7,448
1960-61	7,703
1961-62	8,757
1962-63	9,645
1963-64	9,812
1964-65	10,158
1965-66	11,397
1966-67	11,957
1967-68	12,825
1968-69	13,917

^aSources: Chancellor's Office, Oregon State System of Higher Education, Eugene and Office of Dean of Administration, Oregon State University, Corvallis.

Appendix B-3

OREGON STATE UNIVERSITY STUDENT ENROLLMENT
1947-48 THROUGH 1968-69
SPRING TERM^a

Year	Under- Graduate	Graduate	Total
1947-48	6,271	387	6,658
1948-49	6,180	410	6,594
1949-50	5,497	502	5,999
1950-51	4,541	556	5,097
1951-52	4,001	417	4,418
1952-53	3,898	435	4,333
1953-54	3,907	426	4,333
1954-55	4,364	440	4,804
1955-56	5,112	449	5,561
1956-57	5,675	484	6,159
1957-58	6,382	615	6,997
1958-59	6,302	662	6,964
1959-60	6,184	739	6,923
1960-61	6,468	890	7,358
1961-62	7,236	1,074	8,310
1962-63	7,787	1,136	8,923
1963-64	8,073	1,256	9,329
1964-65	8,278	1,417	9,695
1965-66	9,192	1,530	10,722
1966-67	9,608	1,735	11,343
1967-68	10,335	1,887	12,222
1968-69	11,266	1,974	13,340

^aSources: Chancellor's Office, Oregon State System of Higher Education, Eugene, and Office of Dean of Administration, Oregon State University, Corvallis.

Appendix B-4

OREGON STATE UNIVERSITY--OTHER VARIABLES
GRANT EXPENDITURES, 1944-45 THROUGH 1967-68^a

Year	Grant Expenditures
1944-45	16,685
1945-46	26,118
1946-47	60,903
1947-48	68,979
1948-49	82,004
1949-50	85,171
1950-51	110,039
1951-52	139,133
1952-53	160,268
1953-54	276,924
1954-55	255,795
1955-56	402,306
1956-57	529,806
1957-58	665,997
1958-59	902,583
1959-60	1,169,421
1960-61	1,786,372
1961-62	2,116,748
1962-63	2,815,566
1963-64	4,798,854
1964-65	6,209,021
1965-66	6,540,077
1966-67	7,987,800
1967-68	9,678,040

^aSource: Office of the Dean of Administration, Oregon State University, Corvallis.

Appendix B-5

OREGON STATE UNIVERSITY--OTHER VARIABLES
WAGE AND SALARY EXPENDITURES
1944-45 THROUGH 1967-68^a

Year	Wage and Salary Expenditures
1944-45	1,859,393
1945-46	2,140,480
1946-47	2,982,575
1947-48	3,508,976
1948-49	4,019,500
1949-50	4,617,307
1950-51	4,867,562
1951-52	5,303,671
1952-53	5,579,425
1953-54	5,962,016
1954-55	6,202,963
1955-56	6,705,970
1956-57	7,376,000
1957-58	9,027,639
1958-59	9,559,841
1959-60	10,442,995
1960-61	11,003,491
1961-62	12,757,391
1962-63	14,161,450
1963-64	17,409,597
1964-65	19,039,365
1965-66	21,921,464
1966-67	25,102,985
1967-68	28,529,907

^aSource: Office of the Dean of Administration, Oregon State University, Corvallis.

Appendix B-6

OREGON STATE UNIVERSITY--OTHER VARIABLES
INSTRUCTIONAL SALARY EXPENDITURES
1944-45 THROUGH 1967-68^a

Year	Instructional Salary Expenditures
1944-45	785,395
1945-46	857,376
1946-47	1,296,968
1947-48	1,547,291
1948-49	1,809,730
1949-50	2,051,034
1950-51	2,029,314
1951-52	2,120,130
1952-53	2,092,808
1953-54	2,326,573
1954-55	2,374,133
1955-56	2,554,193
1956-57	2,814,727
1957-58	3,632,287
1958-59	3,882,767
1959-60	4,200,006
1960-61	4,358,135
1961-62	4,668,578
1962-63	5,287,997
1963-64	6,009,627
1964-65	7,301,198
1965-66	7,176,206
1966-67	8,448,821
1967-68	9,509,298

^aSource: Office of the Dean of Administration, Oregon State University, Corvallis.

Appendix B-7

OREGON STATE UNIVERSITY--OTHER VARIABLES
GRADS AND FELLOWS FTE
1944-45 THROUGH 1967-68^a

Year	FTE
1944-45	2.6
1945-46	2.7
1946-47	20.5
1947-48	26.2
1948-49	34.5
1949-50	31.5
1950-51	25.8
1951-52	25.0
1952-53	24.3
1953-54	28.2
1954-55	27.4
1955-56	26.3
1956-57	28.3
1957-58	36.8
1958-59	39.7
1959-60	45.2
1960-61	52.7
1961-62	56.3
1962-63	59.0
1963-64	
1964-65	60.8
1965-66	66.2
1966-67	75.3
1967-68	77.8

^aSource: Chancellor's Office, Oregon State System of Higher Education, Eugene.

Appendix B-8

OREGON STATE UNIVERSITY--OTHER VARIABLES
ACADEMIC INSTRUCTIONAL STAFF FTE
1944-45 THROUGH 1967-68^a

Year	Professors	Associate Professors	Assistant Professors	Instructors	Instructional Staff Total
1944-45	76.6	46.7	37.6	20.8	181.7
1945-46	79.9	50.2	51.1	28.7	209.9
1946-47	89.2	66.8	77.0	97.5	330.5
1947-48	86.5	76.2	92.5	129.1	384.3
1948-49	87.5	76.5	99.9	140.0	403.9
1949-50	96.2	87.1	100.4	139.9	423.6
1950-51	91.6	80.8	115.4	114.7	402.5
1951-52	100.4	88.0	105.5	81.7	375.6
1952-53	91.9	92.2	101.5	75.0	360.6
1953-54	93.6	103.2	100.9	68.9	366.6
1954-55	91.5	100.7	113.9	66.4	372.5
1955-56	89.7	108.6	124.6	80.9	403.8
1956-57	94.2	103.0	146.6	86.5	430.3
1957-58	111.1	114.2	141.8	88.5	455.6
1958-59	123.6	105.2	154.0	122.0	504.8
1959-60	134.9	124.3	142.8	115.7	517.7
1960-61	134.4	131.3	152.2	101.9	519.8
1961-62	137.0	144.6	139.7	90.0	511.3
1962-63	145.1	146.5	149.4	82.7	523.7
1963-64	169.0	159.0	173.0	76.0	578.0
1964-65	182.4	169.4	171.0	69.2	592.0
1965-66	202.7	163.6	182.2	61.3	609.8
1966-67	215.9	194.1	199.3	54.3	663.6
1967-68	238.4	201.4	200.4	76.1	716.3

^aSource: Chancellor's Office, Oregon State System of Higher Education, Eugene.

Appendix B-9

GENERAL DEMOGRAPHIC VARIABLES
 OREGON POPULATION--FEDERAL AND STATE SOURCES
 1945 THROUGH 1968^a

Year	Federal Sources	State Sources
1945	1,250,000	1,227,200
1946	1,338,000	1,347,900
1947	1,361,000	1,423,300
1948	1,405,000	1,470,800
1949	1,431,000	1,511,200
1950	1,532,000	1,521,300
1951	1,556,000	1,568,000
1952	1,582,000	1,602,100
1953	1,601,000	1,636,800
1954	1,626,000	1,662,680
1955	1,659,000	1,690,840
1956	1,698,000	1,734,650
1957	1,712,000	1,737,470
1958	1,718,000	1,728,550
1959	1,746,000	1,777,000
1960	1,772,000	---
1961	1,788,000	1,816,345
1962	1,817,000	1,825,138
1963	1,852,000	1,856,190
1964	1,886,000	1,906,000
1965	1,937,000	1,972,150
1966	1,973,000	1,999,780
1967	1,999,000	2,006,360
1968	2,008,000	2,050,900

^aBureau of Business and Economic Research, Oregon Economic Statistics 1968 and 1969, University of Oregon, Eugene.

Appendix B-10

GENERAL DEMOGRAPHIC VARIABLES
BENTON COUNTY, CORVALLIS AND ALBANY POPULATION
1945 THROUGH 1968^a

Year	Benton County	Corvallis	Albany
1945	23,500		
1946	26,900		
1947	27,400		
1948	28,600		
1949	31,500		
1950	31,570		
1951	33,700		
1952	34,800		
1953	35,000		
1954	34,370		
1955	34,180		
1956	36,480	17,900	12,300
1957	37,980	18,500	12,800
1958	37,900	19,100	13,000
1959	38,000	20,250	14,300
1960	39,165	20,669	12,926
1961	41,556	22,350	13,230
1962	43,010	25,633	13,488
1963	45,630	26,440	14,347
1964	45,666	27,383	15,088
1965	45,800	28,400	15,700
1966	47,000	29,500	16,500
1967	47,000	29,500	17,000
1968	48,150	31,350	17,700

^aSource: Center for Population Research and Census,
Portland State University, Portland, Oregon.

Appendix B-11

GENERAL DEMOGRAPHIC VARIABLES
 BENTON COUNTY BIRTHS, BENTON COUNTY SCHOOL AGE CENSUS (4-19)^a
 AND STUDENT IN-MIGRATION, 1944 THROUGH 1968

Year	Benton Co. Births ^b		Benton Co. School Age Census (4-19) ^c	Student In- Migration ^d
1954	731			
1955	784			
1956	801	1944-45	2,622	
1957	852	1945-46	2,855	217
1958	853	1946-47	2,859	75
1959	919	1947-48	2,853	137
1960	961	1948-49	2,999	150
1961	928	1949-50	3,488	155
1962	860	1950-51	2,745	192
1963	827	1951-52	2,930	197
		1952-53	3,342	192
		1953-54	3,491	263
		1954-55	3,676	215
		1955-56	5,248	210
		1956-57	5,551	232
		1957-58	6,179	262
		1958-59	6,523	321
		1959-60	7,274	415
		1960-61	7,690	368
		1961-62	8,013	419
		1962-63	8,730	407
		1963-64		382
		1964-65	9,677	404
		1965-66		513
		1966-67	9,855	385
		1967-68		545

^aIncludes students from Linn County attending Corvallis District 509J.

^bSource: Oregon State Board of Health, Portland.

^cSource: Linn-Benton Intermediate Education District Office, Albany, Oregon.

^dSource: Central Office District 509J, Corvallis, Oregon.

Appendix B-12

VARIOUS ECONOMIC VARIABLES FOR CMA
 CORVALLIS AND ALBANY BANK DEPOSITS
 1946 THROUGH 1968^a
 (dollar amount in thousands)

Year	Corvallis Bank Deposits	Albany Bank Deposits	Total Bank Deposits
1946	17,774	15,900	33,674
1947	17,998	16,175	34,173
1948	17,841	15,473	33,314
1949	17,040	15,173	32,213
1950	19,106	16,472	35,578
1951	20,174	17,703	37,877
1952	22,292	19,575	41,867
1953	22,415	20,284	42,699
1954	24,065	20,924	44,989
1955	25,421	21,471	46,892
1956	25,103	21,915	47,023
1957	26,104	20,699	46,803
1958	28,744	24,630	53,374
1959	31,131	24,734	55,865
1960	30,907	25,002	55,909
1961	32,269	26,866	59,135
1962	36,208	28,582	64,790
1963	41,084	30,763	71,847
1964	45,623	32,074	77,697
1965	47,838	34,378	82,216
1966	51,222	35,876	87,098
1967	56,395	43,552	99,947
1968	73,955	51,376	125,331

^aSource: Banking Division, Department of Commerce,
 State of Oregon, Salem.

Appendix B-13

VARIOUS ECONOMIC VARIABLES FOR CMA
 BENTON COUNTY MOTOR VEHICLE PASSENGER AND TOTAL REGISTRATION
 1946 THROUGH 1968^a

Year	Passenger	Total
1946	7,197	8,328
1947	8,457	9,887
1948	9,784	11,432
1949	10,924	12,643
1950	12,007	13,800
1951	10,860	12,566
1952	10,809	12,391
1953	11,118	12,740
1954	12,109	13,722
1955	12,815	14,299
1956	13,050	14,964
1957	13,349	15,354
1958	14,117	16,189
1959	14,816	16,971
1960	16,064	18,659
1961	16,434	19,065
1962	16,946	19,813
1963	17,991	21,186
1964	19,409	23,033
1965	20,492	24,486
1966	21,300	25,548
1967	22,381	26,503
1968	22,920	27,482

^aSource: Department of Motor Vehicles, State of Oregon, Salem.